JULY 1958

VOL. 20 NO. 8

MINING WORLD

How Geophysical Prospecting Found Craigmont Ore Page 44

Ike Mine — Now Big Indian's Biggest Bonanza Page 47

How Pima Mines Deep Narrow Pit

Page 34

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PRODUCER

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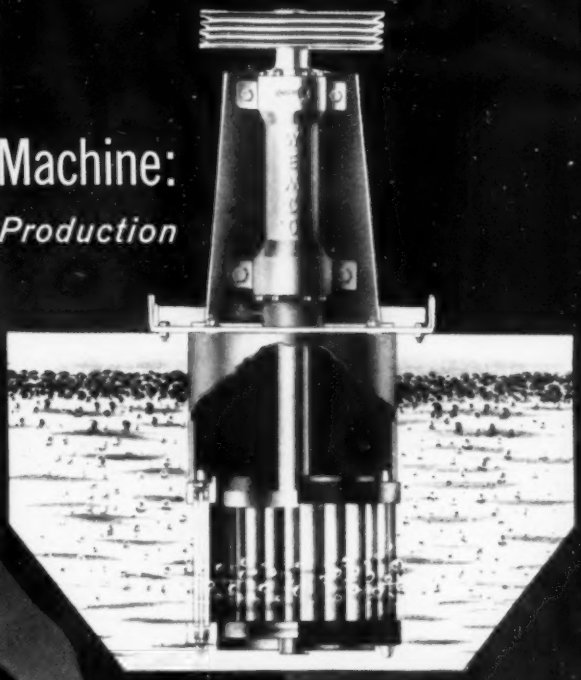

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Right off the Wire

An application of television shows a pilot the image of his plane superimposed on a map of the territory over which he is flying.

An X-ray inspection method for solid cast rocket fuels reveals any cavities or fissures that would interfere with burning.

A new machine at Simplex applies Condex Interlocked Armor over cable cores having diameters up to 4.5".

An electronic guidance system will help river pilots to maneuver long strings of barges around the bends and under the bridges of the Mississippi.

A new facility for advanced research in thermonuclear reactions is expected to generate temperatures in the millions of degrees.

A land-mine exploder has been developed by the Army which will detonate buried explosives without damage to the exploder or the tank that carries it.

A new alkaline flashlight battery is said to last ten times as long as ordinary dry cells and to deliver more power.

A generator-powered flash-bulb holder is about the size of an electric razor. Half a turn of a wheel stores enough electricity in a capacitor to fire the bulb.

A television tube only five inches thick has been developed in England.

A process has been developed for electroplating copper on aluminum. The plating can be tinned, soldered or formed.

A new synthetic rubber is resistant to oils, fuels and solvents and retains its properties at temperatures as high as 400°F.

A new chemical compound slows the growth of any part of a tree without affecting the rest.

A new electronic instrument analyzes the sequence of chemical reactions in the burning of rocket fuels in one ten-thousandth of a second.

A single relay system across Canada from Halifax to Victoria will carry television programs and telephone conversations.

The floodlights at Niagara Falls have been redesigned to give ten times the illumination of the former twenty-five-year-old system with no increase in power consumption.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Among the United States exhibits at Brussels will be an outline of world history for the entire Christian era stored in a computer. Any item can be found in two-thirds of a second and printed in any one of ten languages.

The first digital computer fast enough to evaluate the performance of a missile in flight is said to be twenty-four times faster than preceding models.

A new X-ray technique reduces radiation exposure to a fraction of that now used for diagnosis.

A new truck transmission has twelve speeds in one gear box controlled by one lever.

A new machine can weigh and sort coins at the rate of 18,000 per hour with an accuracy of plus or minus one-fourth of one per cent.

A new desk-top machine covers one or both sides of documents with clear plastic film.

A device for practice in marksmanship shoots, instead of a bullet, a flash of light, which shows on the target.

An ultra-sensitive space speedometer measures acceleration in any direction.

A Simplex Laboratory

At the Simplex plant in Cambridge, six modern, well-equipped laboratories similar to the one shown here are devoted to the never-ending search for new, better materials and methods which result in new, better wire and cable products. Over the years, this program of concentrated, intensive research has brought about a great number of the most important technical advances and product improvements that have made Simplex the leader in the wire and cable industry.

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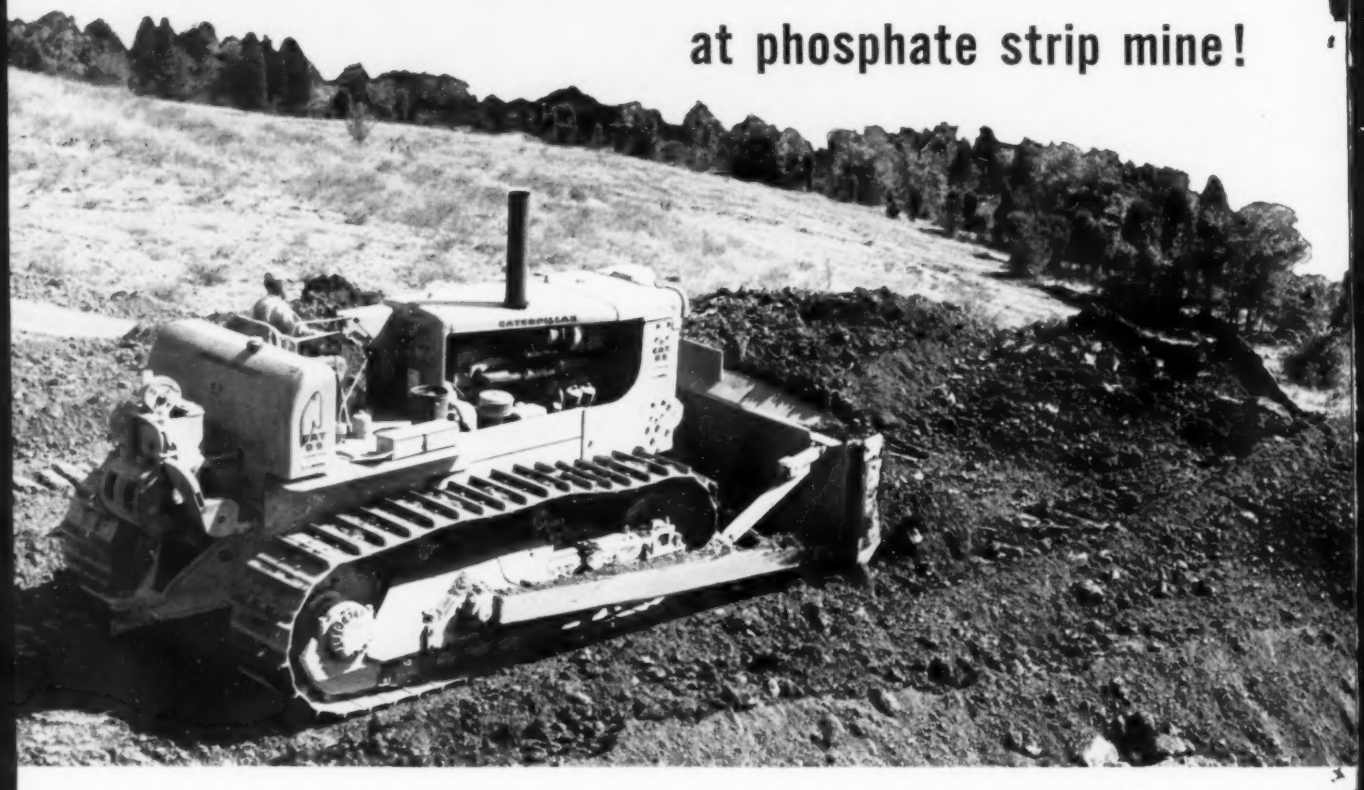
at phosphate strip mine!



Here's the remarkable record being made by this giant CAT* D9 Tractor with No. 9S Bulldozer on a phosphate strip mine near Columbia, Tennessee:

—Averages 16 cu. yd. per 150-ft. pass dozing overburden to spoil bank.

—Makes 25 passes per hour, working a 10-hour day.

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Published monthly except in April when publication is semi-monthly

VOLUME 20 **JULY 1958** No. 8

OPERATIONS—TECHNOLOGY

London Letter

A Special Report on Developments Abroad 33

By Max F. Holsinger

During an interview in London with Harry Oppenheimer, chairman, Anglo American Corporation of South Africa Ltd., much of interest to Mining World readers was learned. South African mining is growing, copper expansion continues, and vigorous prospecting is underway.

Open Pit Mining

New Mining Trends at Pima's Arizona Pit 34

By Henry G. Grundstedt

Pima uses skip hoisting in narrow deep pit to elevate ore and waste to rim. New rubber tired dozer is under test. A report on How Mining Geophysics Found Deeply Buried Pima Ore Body is included.

Refining

Electron Beam Refining Yields High Purity Metals 40

By Stanley H. Dayton

Temescal Metallurgical Corporation has developed a new electron beam melting process under high vacuum to yield ultra pure columbium, tantalum, zirconium, titanium, and beryllium.

Prospecting

Soil Sampling and Magnetometer Surveying Finds Copper Ore .. 44

By R. E. Renshaw and Franklin Price

Soil sampling by rubianic acid method indicated copper. A magnetometer survey outlined important anomalies. Diamond drilling has since proven 20,000,000 tons of 2.0 percent copper and 25 percent iron.

Underground Mining

Ike Mine—Big Indian's Biggest Bonanza 47

In Utah's Big Indian district 34 men have mined $2,500,000 worth of uranium ore in last 60 days. The Ike was the only mine to receive the AEC $10,000 bonus for high grade ore production. This article shows that there was more than one high grade shipment at the Ike.

Money Making Methods

Corrosion Proof Light Weight Plastic Pipe and Nchanga's Method for Removing Broken Grinding Balls Ahead of Cyclones 51

IN THE NEWS

Central Eastern News 61
Iron Range News 63
Rocky Mountain News 65
Northwest News 67
Southwest News 71
International News 75

DEPARTMENTS

Drifts and Crosscuts 5
Mining World Newsletter 7
Capitol Concentrates 9
International Panorama 32
U. S. Personalities in the News 53
Newsmakers in International Mining 55
Production Equipment Preview ... 56
Coming Conventions 74
Metal and Mineral Prices 87
Advertiser's Index 90

ON THE COVER

Another load of ore at Pima's Arizona open pit copper mine. The Kenworth truck dumps its 16-yard load of ore directly into the 22-ton capacity National Iron Works skip.

MILLER FREEMAN PUBLICATIONS

GRAB SAMPLES From the Mail

Nitrate Blasting In Small Holes

Dear Sir:

I have read with considerable interest the series of articles and letters in Mining World about the use of ammonium nitrate for blasting. I am sure that readers will be interested in the use of ammonium nitrate for blasting small diameter holes in the Philippine Islands.

If seeing is believing, ammonium nitrate will detonate successfully and efficiently under the following conditions: (1) after months of storage in the tropics; (2) in a 1¾-inch-diameter vertical borehole in disseminated chromite and in dunite; and (3) detonated by means of safety fuse, a No. 6 cap and a single stick of 45 per cent dynamite. These conclusions were drawn as the result of experimental blasting of a single 80 pound sack of nitrate. The blasting was conducted in the open-pit mine of Consolidated Mines, Inc., at Coto, Masinloc, Zambales, Philippines. The mine is the largest refractory chrome mine in the world and is operated under contract by Benguet Consolidated, Inc.

All blasting was done under supervision of A. N. Robinson, mine superintendent, and the writer. A total of 17 holes were fired: 11 in high silica disseminated chromite and six in solid dunite. All holes were 12 feet deep, vertical, dry, 1¾-inch diameter, and with a 5-foot burden. The 80 pounds of nitrate were prepared on the benches in the triple--ply-bag by sprinkling 6.53 pounds of Shell Dieseline (7.5 per cent by weight) into the sack. The material was kept in the sack during the four days of testing. The nitrate was prilled fertilizer grade and had been stored in a bodega for nine months without any special precautions and with no injurious effects whatsoever from high humidity.

The prepared nitrate was ladled into hole by hand and not tamped, though all dynamite was tamped and the stemming (drill cuttings) very well tamped to the collar. Various amounts of nitrate and dynamite were used 'til the dynamite was reduced in the last blast to a single stick of 45 per cent Dupont Gelex No. 2, 1 by 7 inches. The first two blasts (eight holes) were fired in sequence with M S delays, but the last two blasts (9 holes) were shot with timed orange-wax safety fuse and No. 6 caps. The last blast (six holes) was the best from an economic standpoint and was in the hardest rock in the pit, the dunite occurring on the footwall of the chromite lense.

The normal procedure for blasting the six holes fired in the last blast would have been to use nine sticks of 45 per cent powder per hole with safety fuse and No. 6 caps, properly timed. These holes each had approximately 3.85 pounds of nitrate and 0.25 pounds of 45 per cent dynamite, a ratio of 15 to 1. The comparative costs of the nitrate blast versus regular blasting were 4.50 pesos to 7.00 pesos. The nitrate cost considerably more than if it had been purchased in ton lots, and the writer believes the cost could be reduced to 50 per cent of the cost of regular blasting.

The use of electric caps or primacord with the nitrate would reduce savings considerably at Coto as all blasting is done selectively with the cheaper safety

Continued on page 85

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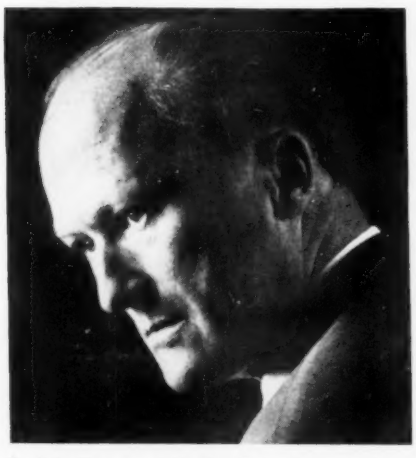
MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

MINING WORLD Appoints European Representative



Establishment of European representation in Cologne, Germany, and appointment of Dr. Walter F. Vogeno as director of European Operations for MINING WORLD-WORLD MINING and other business and technical publications, has been announced by William B. Freeman, president, Miller Freeman Publications.

Doctor Vogeno was formerly associated with Klockner-Humboldt-Deutz AG, leading West German manufacturer of mineral dressing and processing equipment, diesel engines, and tractors and industrial power units. He is well known in European mining, metallurgical, technical, and industrial circles.

While Dr. Vogeno's initial activities will primarily be devoted to MINING WORLD-WORLD MINING, he will also cover European developments for other Miller Freeman technical magazines—PULP & PAPER INTERNATIONAL, THE LUMBERMAN, THE TIMBERMAN, PACIFIC FISHERMAN, and CONSTRUCTION WORLD (Canada).

In making the announcement of the appointment, Mr. Freeman stated the company's objectives as follows: "The expanded program of Miller Freeman Publications in Europe, to be followed shortly by similar facilities in London for the United Kingdom, has been undertaken in recognition of the growing technological developments taking place in the minerals industries in Europe which must be accorded attention by technical magazines."

Establishment of the new MINING WORLD facilities in Europe is the outgrowth of study and development work carried on in Europe since mid-1957 by Max F. Holsinger, General Manager of Miller Freeman's International Operations, and General Manager of MINING WORLD, on leave from his headquarters in San Francisco.

Dr. Vogeno brings to his new position a broad background of technical experience in mining, mineral processing, and industrial production. He graduated with honors from Technische Hochschule at Aachen, West Germany, in 1934, receiving a certified degree (Dipl-Ing.). He later did work on his Doctor's thesis at the Technical University. Dr. Vogeno came to the United States as an exchange student, where he received a Master of Science degree in mineral dressing from Montana School of Mines in 1936.

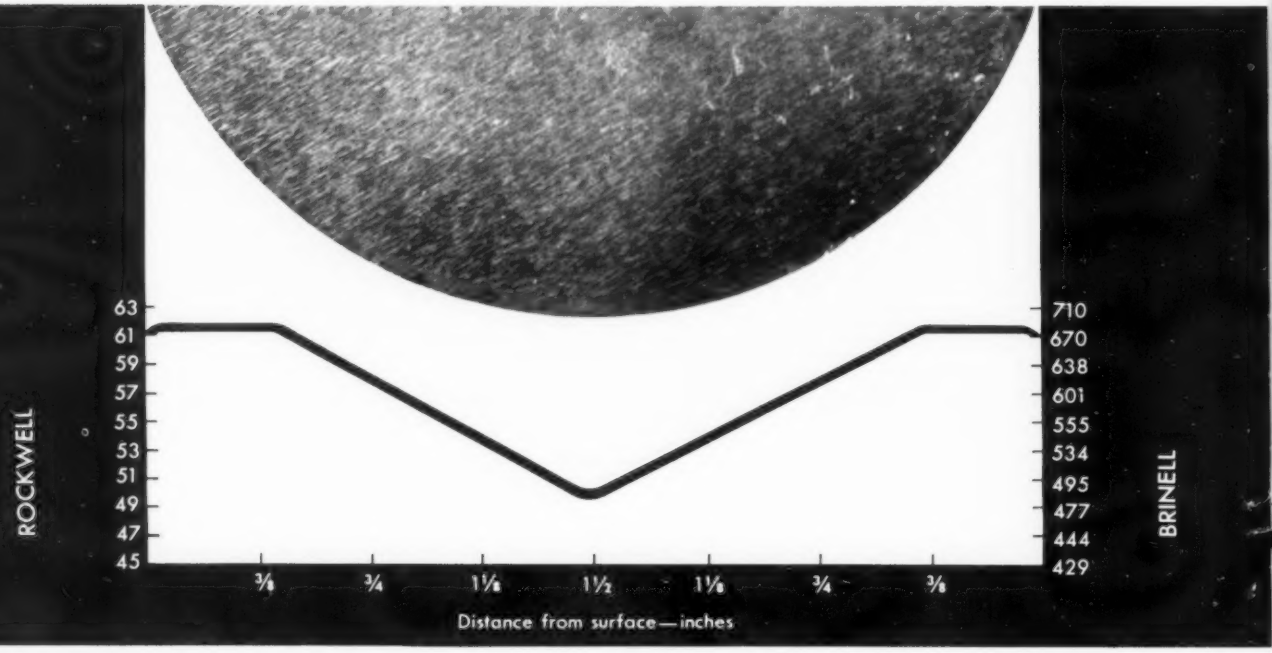
From his Cologne headquarters, Dr. Vogeno will cover important mineral industry developments in Europe. Watch for his reports and articles in future issues.

controlled metal hardness means

heat-treated cast alloy steel

NACO GRINDING BALLS

cut per-ton grinding costs



Note how new casting process and full heat treatment show controlled hardness between surface and inner core.

Spectrographic analytical control of elements in steel making processes and controlled heat treatment assure the desired metallurgical grain structure which produce the type of hardness required for maximum wearing qualities.

Performance reports on Naco solid cast alloy steel grinding balls from mills now using them have been universally favorable—both in lasting qualities and impact absorption.

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MINING WORLD NEWSLETTER

Canada . . . Australia . . . Brazil

July 1958

The spotlight is on the Quebec-Labrador area of Canada.

More than $300,000,000 is expected to be spent in the next few years on development of this vast iron ore field.

Already calling for bids is Quebec Cartier Mining Company (a U.S. Steel subsidiary) which will start with a 193-mile railroad and 60,000-hp. hydroelectric plant. Construction of deep harbor facilities, concentrator, two new town sites, and open-pit mine come next.

The go-ahead on Wabush Iron Mines' 5,000,000-ton-per-year operation is expected soon. $1,000,000 is to be spent this season on further exploration.

These are low-grade deposits, reaffirming the change in thinking about iron ore.

Readily concentratable ores now are more desirable than some shipping grade ores. Canadian low-grade ores are particularly attractive to U.S. steel producers because mineral liberation takes place at a coarse grind.

Australia, too, is testing low-grade ore for blast furnace units. Broken Hill Pty. Company is testing magnetic oxide conversion for production of high-grade concentrate from taconite.

West German industrialist Alfried Krupp is negotiating with Broken Hill over mutual development of an iron ore operation.

New Caledonia's untouched iron ore deposits also interest him. Someday they will be used in greater quantities, despite their impurities, in Australia's growing steel furnace industry.

Don't count British Columbia's Highland Valley out as a major copper province despite ASARCO's withdrawal from the Bethlehem Copper Corporation's ground.

More than $1,400,000 was spent by the two firms in exploration that indicated ore bodies with 100,000,000 tons of about 0.8 percent copper.

Latest major discovery in Highland Valley area, made by Craigmont Mines, to the south of Bethlehem, is detailed in this issue. Kennecott, Phelps Dodge, and Noranda are active in Highland Valley, too.

ASARCO will still be an important factor in copper; in fact, with completion of Toquepala, it will have more copper than ever. Also East Pima will make a fine mine, and a new prospect in Zacetecas shows high-grade ore over impressive widths.

Latest political maneuver is Secretary Seaton's proposal to stockpile 150,000 tons of copper at 27.5 cents a pound. By this, he hopes to get the Reciprocal Trade Act extended, please the foreign interests, make friends with the State Department, and keep the vital domestic industry alive.

Will similar proposals be advanced for other metals?

There's lots more than coffee in Brazil.

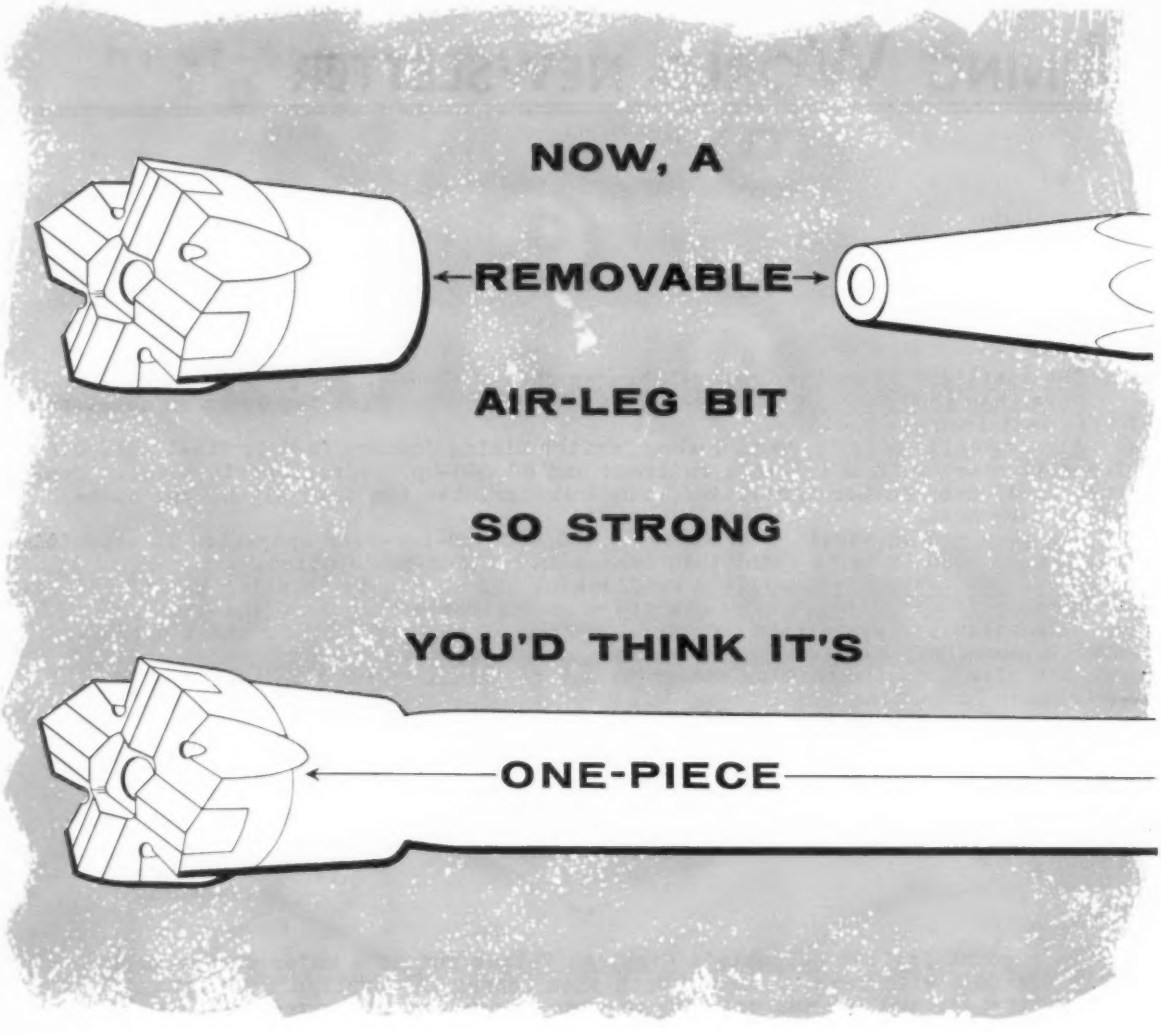
A major U.S. automobile manufacturer is quietly exploring what was thought to be a lead mine, but now appears to be a whole lead-zinc district.

A large Canadian base metal producer is providing technical advice for this project, and plans are already underway for mining and construction of a concentrator and smelter.

The exploration subsidiary of a leading U.S. copper producer has been probing a conglomerate gold deposit in Brazil. Grade is 0.5 to 0.6 ounces per ton, but metallurgical problems may slow development.

Brazilian diamonds are attracting much attention. Prospecting is for gem stones rather than industrial diamonds.

Iron ore, columbite, and manganese continue to draw interest.



THE new Timken® tapered socket bit for air-leg drills is removable—yet has the strength of one-piece steels. The tapered union gives you all the advantages of removability without the weaknesses that cause other removable bits to fail on air-legs.

Because the new Timken tapered socket bit is removable, you get all these advantages that intraset steels can't give:

You don't have to throw away the drill steel just because the carbides wear out. You do with intrasets.

You carry just a pocketful of bits into the mine. With intrasets you carry an armload of steel.

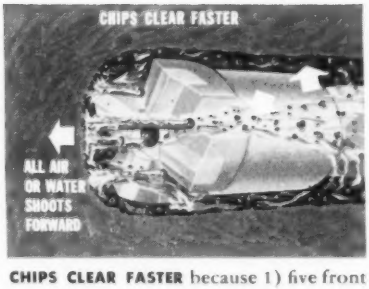
You can quickly change bit gauge sizes using the same steel. You have to change a whole steel with intrasets.

You don't have to lug the whole steel back to the shop to resharpen the cutting edges. You do with intrasets.

You get four carbide cutting edges, which insures longer gauge wear.

Two new frontal design features enable the Timken tapered bit to clear chips faster (see picture at right). And new special-analysis carbide inserts give superior wear-resistance with added shock-resistance. You can recondition them many times.

For removability *and* strength, use the new Timken tapered bit—the air-leg bit of the future. Write for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

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Senate Interior Committee Hears Industry Views On Seaton Plan

Interior Secretary Fred A. Seaton has presented to Congress the draft of a bill designed to implement the Domestic Minerals Stabilization Plan he outlined to the Senate Interior Committee late in April. The bill was introduced on May 26 as S. 3892 by Senator Murray, chairman of the Interior Committee.

Industry witnesses appeared at hearings opening June 9, and Secretary Seaton testified at a later date.

The bill directs the Secretary of Interior to make stabilization payments to domestic producers of ores or concentrates of copper, lead, zinc, acid-grade fluorspar, and tungsten when the market price is below the stabilization price. These payments are to be "an amount which shall not exceed the difference between the amount actually received by the producer from the sale and an amount which the producer would have received from such ores and concentrates had the market price of the material produced therefrom at the time of sale been equal to the stabilization prices."

Industry spokesmen have reported proposed stabilization payments too low and have offered "compromise" payments which would be acceptable. The following table details the plan, compromise payments, selling prices on 1 June, and estimated current annual domestic output rate as of 1 June.

	Maximum Subsidy Proposed	Maximum Sales Plus Subsidy	Compromise Payments Proposed	Maximum Tonnage Per Subsidy Year	1 June Selling Price	Estimated Current Annual Output
COPPER 3.5¢ pound		27.5¢	29.0¢	1,000,000	25.0¢	1,000,000
LEAD 3.375¢		14.75¢	16.0¢	350,000	11.5¢	200,000
ZINC 2.5¢		12.75¢	14.0¢	550,000	10.0¢	500,000
FLUORSPAR $8.00		$48.00	$55.00	180,000	$48.00	180,000
TUNGSTEN $18.00 (Unit)		$36.00	$42.50	375,000	$14.00	150,000

Other provisions of the bill would:

(1) Authorize the establishment of quarterly limitations on each material. If sales upon which stabilization payments are claimed exceed such limitations, the Secretary could effect an equitable distribution among the producers; and if the total production from domestic mines of any of the materials exceeds the quarterly limitation in any one quarter, he could establish for succeeding quarters limitations in advance on the quantities of each producer that would be eligible for payments.

(2) For tungsten, payments would be limited to 15,000 units per quarter from production originating in any one mining district.

(3) When the total quarterly production of any of the materials on which stabilization payments are to be made has exceeded the quarterly limitation for each of two successive quarters by more than these amounts—copper, 30,000 tons; lead, 9,000 tons; zinc, 15,000 tons; fluorspar, 5,000 tons; and tungsten, 55,000 units—the Secretary is required to suspend stabilization payments on such material sold thereafter until the annual rate of domestic production approximates the annual ceiling on eligible production.

In his presentation of the plan on April 28, Seaton had estimated the cost of the program for the first year at $161,090,000. Using the floor prices set forth in the bill to implement the program—and which had not been mentioned in the initial presentation—the estimated cost of the program would be $129,315,000 if maximum subsidies were required for the total eligible output.

By and large, industry leaders are reserving their comments on the bill until more details concerning regulations, administration plans, etc., are available. However, no enthusiasm for the plan is in evidence. Most of those who have commented seem to see the plan as a precedent for similar proposals from most of the other natural resource industries, and a definite threat to the free-enterprise system within the mining industry.

• Bills Seeks Extension of DMEA

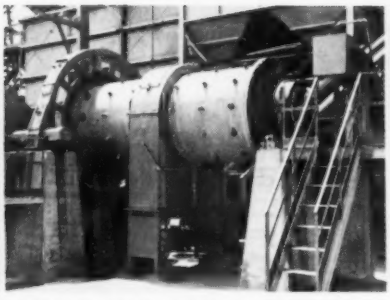
Senator James E. Murray has introduced S. 3817, a variation of Secretary of Interior Seaton's bill to extend the life of DMEA. The Murray bill is identical to the Seaton bill with the exception that in the place of the "pauper's oath" (which was designed to limit borrowing by big companies but which caught about everyone in the same trap), a limitation of $250,000 is set on a single exploration contract. The way is left open, however, to write additional contracts on the same project should the outcome of the first work indicate this to be desirable.

• Assessment Change Is Approved

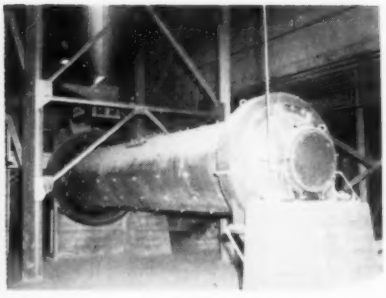
The Senate on May 19 passed S. 3199 to change the period for doing annual assessment work on unpatented mineral claims so the year will run from September 1 of one year to September 1 the succeeding year, and to make such change effective with respect to the assessment work year commencing in 1959, and to provide for the suspension of such annual assessment work for the year ending July 1, 1958. The passage of S. 3199 is particularly interesting as the Interior Committees of the House and the Senate for years have had an unwritten agreement not to suspend assessment work unless a national emergency exists.

S. 3199 would limit the assessment suspension to not more than six claims held by an individual, or to not more than 12 claims held by a partnership, association or corporation. Filing of a notice of intention to hold also would be required.

CEMENT . . . *This 9′ 6″ x 25′ Marcy Grate Discharge Ball Mill is one of eight Marcy Mills in a large western cement plant.*



SPECIFICATION SANDS . . . *5′ x 12′ Marcy Center Peripheral Discharge Rod Mill producing specification sands.*



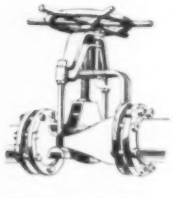
GYPSUM . . . *4½′ x 20′ Marcy Grate Discharge Ball-tube Mill, with peripheral discharge feature, dry grinding high-temperature calcined gypsum.*

Marcy Grinding Mills

- ***center and end peripheral discharge rod mills, open end rod mills, grate discharge ball mills, tube mills, pebble mills, acid-proof mills, batch mills.***
- ***for cement, specification sands, clay, fibrous materials, ore.***
- ***wet or dry grinding.***
- ***29 different diameter sizes, from 12″ to 12′ 6″ inside diameter, are operating and proved in the field.***
- ***grind material 1½″ or finer to a product as fine as 325 mesh.***
- ***capacities up to 6650 tons per 24 hours.***

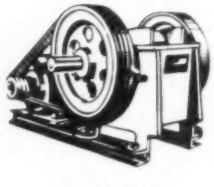
The Marcy principle of grinding . . . "rapid change of mill content is necessary for high efficiency" . . . is accomplished by use of the Marcy *full-grate* discharge on ball mills, the open end feature on rod mills, and by the steep gradient and short distance of travel in the peripheral discharge mills. This principle has proved in hundreds of installations, to give up to 33% greater capacity than overflow mills and lower KWH per ton.

SPECIALISTS IN GRINDING FOR MORE THAN 50 YEARS

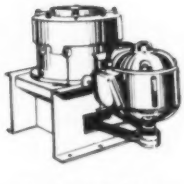


Massco-Grigsby Pinch Valves . . . for abrasive and corrosive pulps; rubber and neoprene; 1″ through 14″ dia.

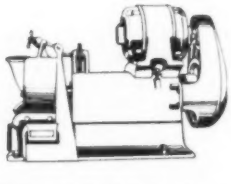
Marcy Pulp Density Scale . . . direct reading of weight, specific gravity, percent solids.



4″ x 6″ Massco Lab Jaw Crusher . . . welded steel frame, manganese steel jaw and check plates, adjustable for plate wear.



6″ and 10″ Massco Gy-Roll Reduction Crusher . . . reduces ½″ feed to 10 mesh in one pass.



Massco-McCool Pulverizer . . . disc type with planetary movement. No gears. Grinds to 150 mesh in one pass.

Write for Catalogs

THE MINE AND SMELTER SUPPLY CO.

DENVER 16, 3800 RACE — NEW YORK 17, 122 E. 42ND ST. — SALT LAKE CITY 1, 121 W. 2ND S. — EL PASO, P. O. BOX 1162

SALES AGENTS AND LICENSED MANUFACTURERS THROUGHOUT THE WORLD

MARCY®

Why the rugged Caterpillar No. 12 is a key machine on any team!

With a long-standing reputation as the "machine that stays full time on the tough jobs," the dependable CAT No. 12 Motor Grader is easy to operate and economical to own. The No. 12 shown here is a key machine because it keeps hauling equipment rolling by maintaining haul roads on mining operations near Schefferville, Quebec. Here Iron Ore Co. of Canada is producing 12 million tons of ore per year from four groups of pits.

The Cat No. 12 Motor Grader has earned its reputation as the "standard of the industry" by handling top production, yet requiring a minimum of maintenance. For example, take the exclusive oil clutch. Constantly protected by oil, this clutch requires adjustment about once every 1,500 hours of operation. And facing wear is negligible, assuring long clutch life.

Check off these additional No. 12 features, and you'll see why owners and operators both prefer it.

Positive mechanical controls for low maintenance costs.
Quality-built constant mesh transmission for long life, less down time.
Long tandem and frame for better utilization of machine.
A powerful "matched" engine that lugs hard without fouling.
Exclusive tubeless tires that eliminate tube and flap failures.

Don't wait—get in touch with your nearby Caterpillar Dealer now. Ask him to give you a practical demonstration. Take time now to save *production* time later!

Caterpillar Tractor Co., San Francisco Cal.; Peoria, Ill., U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

THE MACHINES THAT WORK FULL TIME

This 110-B shovel digs and loads out 4,500 yards of copper ore and overburden every 8-hour shift in a western copper mining operation.

Get INSTANT EXTRA TORQUE to meet every load

Pace-setting Bucyrus-Erie mining shovels give you an electrical control system that speeds acceleration and deceleration on every move, gives instant, extra torque to meet the load, speeds every work cycle.

It's the Bucyrus-Erie improved Ward Leonard variable-voltage control system — job-proved and famous for outstanding results in major open pit mines all over the world.

Your operator commands every operation with well-grouped, simple controls for exceptionally smooth digging, swinging, hoisting, and propelling action. When you want speed . . . or torque . . . you GET it!

The result is more pit output at lower cost. Less mechanical and electrical maintenance, too. Write today for the complete story of these big Bucyrus-Erie electric mining shovels —4½-yd. 110-B, 6-yd. 150-B, 8-yd. 190-B. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

191L58

BUCYRUS ERIE

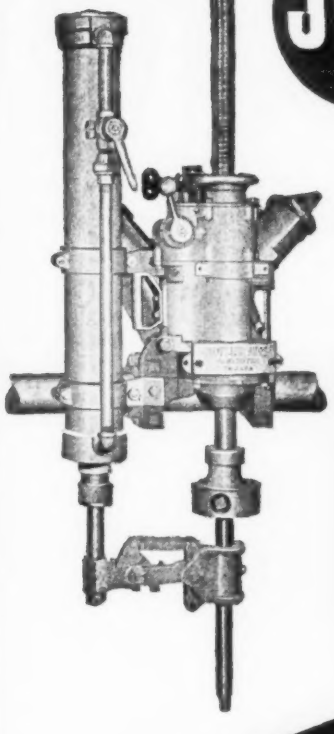
MODERNIZE to economize!

Piston motor or Vane motor

You Decide!

MAXIMUM POWER-MINIMUM AIR CONSUMPTION

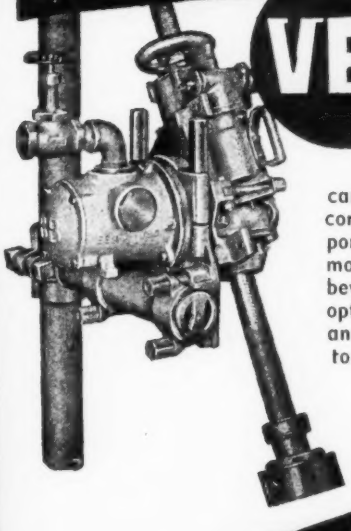
JVR



Reversible version of the world famous JV underground drill. Delivers the same power, speed and dependability. Piston motor excells in high torque characteristics over entire speed range. New JVR features include adding of rods by drill power with reversible motor, right-hand threaded feed screw, rod adapter and built-in waterswivel —features which greatly increase both blasthole and coring footage over conventional drills requiring manual rod handling. Standard chuck assembly optional. Net weight range: 270 to 475 lbs.

MAXIMUM POWER-MINIMUM WEIGHT

VEG



Vane motor powered version of JV. Outstanding feature is lightweight, compact construction. Drill can be speedily dismantled into two convenient units for ease of transportation. One man can readily move and set up. VEG has direct bevel gear drive to swivelhead, with optional ratios of 1.5 to 1, 2 to 1 and 3 to 1. Net weight range: 230 to 360 lbs.

JV, JVR & VEG Rated Coring Capacity

E - 800'	B - 450'
A - 600'	N - 350'

All above drills can be fitted with 3¼", 4½" (standard) or 5⅛" (piston diameter) rod puller.

WE LOOK INTO THE EARTH

DRILLS • BITS • EQUIPMENT • CONTRACTING

The World's Most Complete Diamond Drilling Service

BOYLES BROS
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P&H

If purchases are endorsement...

P&H ELECTRICS ARE THE CHOICE OF SOUTHWEST'S MINES

P&H Electrics are setting new standards of production and maintenance economy in Arizona, New Mexico, Nevada and Utah iron and copper mines. For instance, today *three or more* P&H Electric Shovels are working at *each* of 7 out of Arizona's 8 operating copper mines!

The pattern of preference for P&H among copper mine operators is especially significant. Here, industry management must constantly concern itself with selection and performance of the big shovels—the "giants" that require a large capital investment and importantly influence tonnage costs.

Reasons why P&H Electrics are a popular choice among the southwest's mines include such P&H innovations as MAGNETORQUE® and ELECTRONIC CONTROL—each of these *exclusive* P&H features contribute mightily to steady day-in and day-out high production.

Also, P&H users get single source responsibility, as P&H designs, manufactures and applies all electric rotating equipment specifically for electric shovel service.

HARNISCHFEGER

Construction & Mining Division
Milwaukee 46, Wisconsin

P&H ELECTRIC SHOVEL LINE: 3½ through 10 cu. yd. capacities

for high throughput or long life

Throughput and wear-resistance are two important factors that affect your choice of screening. And the one that is more important to you will determine the type of screening you choose: light wire screens with a large percentage of open area that produce higher tonnage per hour . . . heavy-wire, slow screening that lasts longer, minimizes downtime . . . or medium wire screens that combine some of the features of each.

Effective Open Area 60%—
Fast Screening—Short Life

(Both screens have same size openings.)

Effective Open Area 30%—
Slow Screening—Long Life

But whatever your screening problem—whether you need longer life for hard, extremely abrasive materials, or higher volume on standard jobs—there's a CF&I Screen that's right for you. CF&I offers a choice of:

Weaves: Double Crimp for heavy screens of low effective area; Lock Mesh for very accurate sizing; Flat Weave for least resistance to material.

Openings: Long Slot for relieving blinding or clogging conditions; Rectangular for maximum throughput.

Specifications: Complete range from .035" to 1" diameter wire size; from .063" to 6" clear opening.

In addition, all CF&I Industrial Screens are made from top quality carbon or alloy steel wire. Quality is carefully controlled from blast furnace to wire drawing and weaving operations, to ensure maximum resistance to abrasion, vibration and fatigue.

For prompt, dependable service or engineering assistance, contact the CF&I office nearest you.

6118-B

CF&I **SPACE SCREENS**

THE COLORADO FUEL AND IRON CORPORATION

In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago Detroit • New Orleans • New York • Philadelphia

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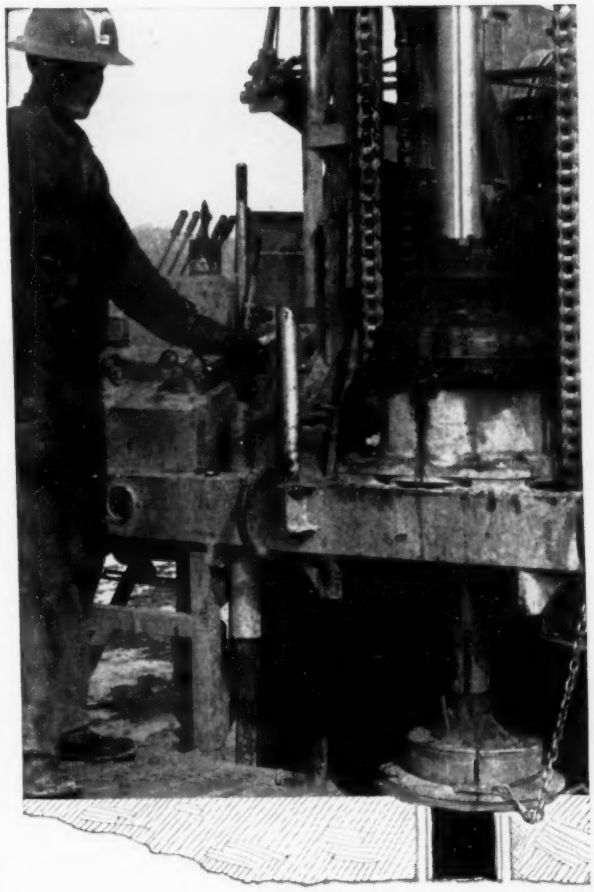
Rides with the bit through rock ...speeds big bore hole cuts...

GARDNER-DENVER

"MOLE-DRIL"*

* TRADE-MARK



Here's added power for your seismograph rig—hard-hitting, in-the-hole power. "Mole-Dril" speeds shot hole drilling . . . and deep hole drilling in hardest rock.

It's easy to use—the "Mole-Dril" screws directly onto the bottom of standard drill pipe . . . a tungsten-carbide "X" bit screws directly onto drill tappet. That's all the "make-ready" it takes to send the "Mole-Dril" through rock.

It's powerful—"Mole-Dril" delivers more foot-pounds of energy to the bit than any other drill of its size. Every pound of hammer energy is transferred directly to the bit.

It's rugged—the "Mole-Dril" has only three moving parts, nine major parts. This simple, rugged construction gives the "Mole-Dril" lasting deep hole drilling durability.

Two models available:

Model AM4 for drilling 4¾" diameter hole.
Model AM6 for drilling 6½" diameter hole.
Write for bulletin.

"Mole-Dril's" positive hole cleaning action

Air at full line pressure flows through drill's air blowing tube directly to bit . . . this direct air stream keeps cutting face clean regardless of drilling depth.

Drill exhaust air passes out up-cast air ports and gives cuttings an additional out-of-the-hole boost.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

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Gardner-Denver Company, Quincy, Illinois
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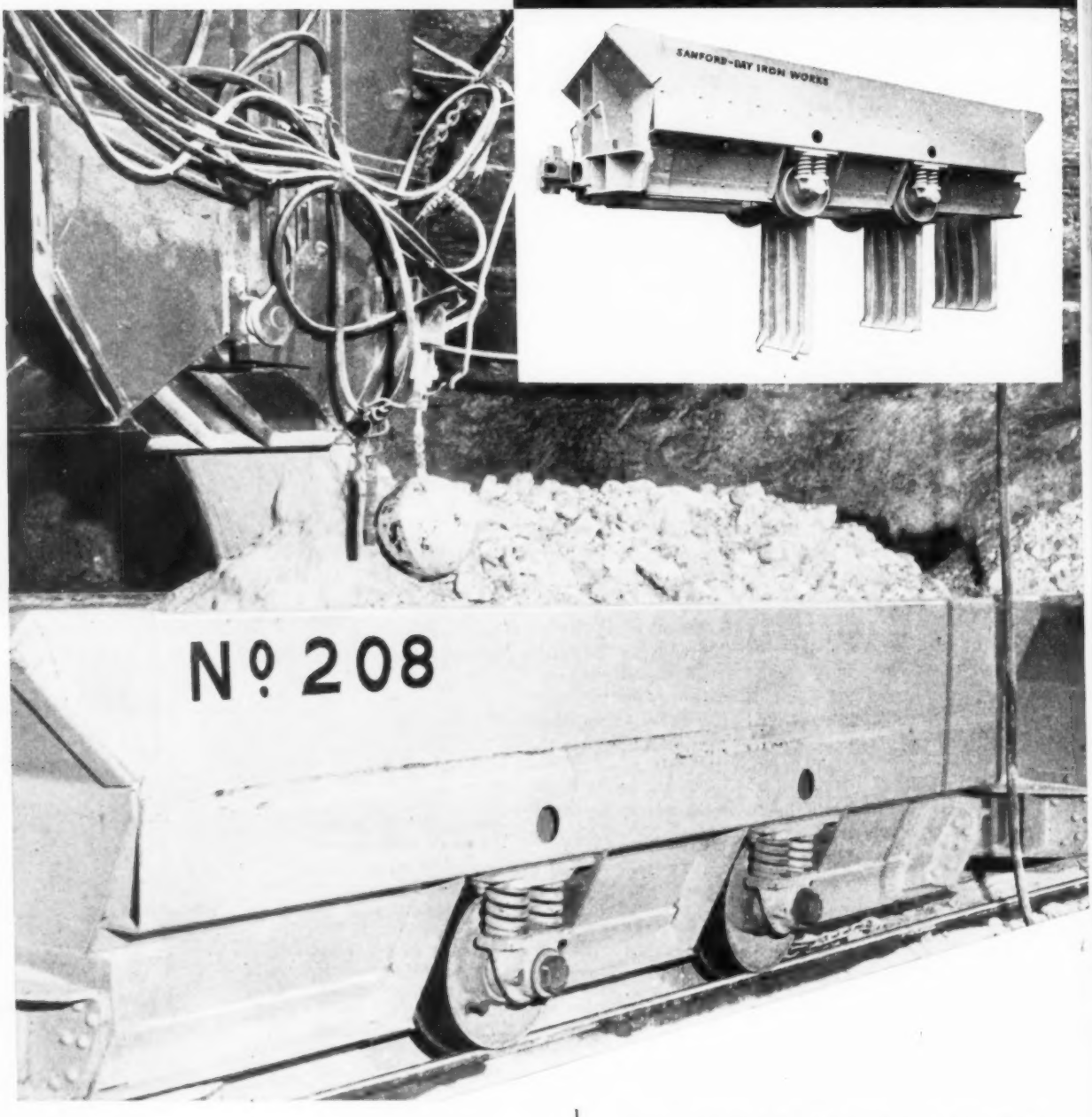
These S-D AUTOMATICS

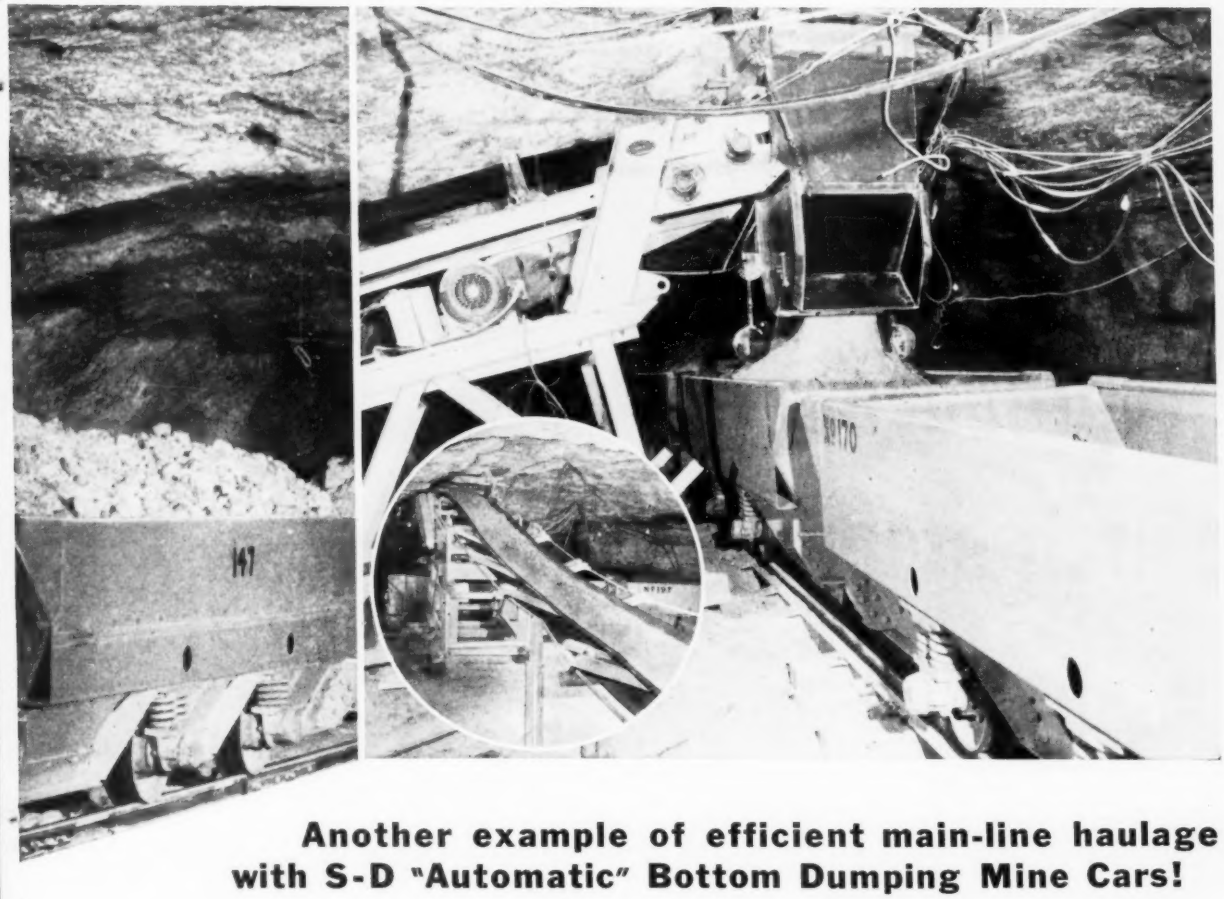


SANFORD-DAY

Knoxville, Tennessee

"SUPER MARKET FOR MINE CARS" — *all types* * PRECISION WHEELS * "BROWNIE" HOISTS, CAR RETARDERS, SPOTTERS, PUMPS AND OIL SPRAY SYSTEMS * GISMO SELF-LOADING TRANSPORT that loads *(mucks)* in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!

have been in service at U. S. Potash 3 years...working 363 days per year, two shifts per day on a seven-mile run!



Another example of efficient main-line haulage with S-D "Automatic" Bottom Dumping Mine Cars!

"Because of their low center of gravity and balanced rugged construction, they hold the track exceptionally well at speeds up to 30-miles-per-hour," reports Mr. Earl H. Miller, resident manager of the Carlsbad, N. M., mining operation of United States Potash Company, Division of United States Borax & Chemical Corporation.

"Also," Mr. Miller continues, "the door operation is very good, allowing the cars to do a good job of self-cleaning." How does the maintenance costs of these cars compare with conventional type ore cars? "We have had very low maintenance costs on the S-D 'Automatics' compared to others we are using."

Note in pictures above and on page at left that mining management at U. S. Potash have further mechanized their main-line haulage with an automatic loading station. We are understandably proud that S-D "Automatics" were chosen for this U. S. Potash operation that incorporates the latest developments in modern simplicity and efficiency. In addition to this installation, S-D "Automatics," like the car illustrated at right, are hauling hard rock in several western mines at tremendous savings! Write us today for complete information. *Sanford-Day Iron Works, Inc., Knoxville, Tennessee*

1/4 to 1/2 TON MORE CAPACITY
Twin Latches FOR SAFE AND SURE LATCHING
SANFORD-DAY IRON WORKS
Safety Sealed AGAINST DUST LEAKAGE

"With our TD-24 we are pushing 40-ton rock slabs —dozing and ripping at a 50% better rate than with our other big tractor," states Owner L. J. Luttjohann. He removes a 24-inch-thick hard rock stratum; rips and dozes-off a soft rock layer with his "24" to uncover high-grade limestone deposits.

How Planet Power-Steered TD-24 outproduces clutch-steered competitor by an amazing 50%

...stripping for Luttjohann Stone Co.,

States Operator Alvin Hanson "This new TD-24 Torque Converter is great for my ego. The other dozer's operator works harder, but I move at least one-half more material per day than he will!"

Dozing 40-ton chunks of stone aside—ripping worthless rock layers into movable spoil—this Planet Power-steered TD-24 is outproducing its 20-ton steering-clutch-steered competitor, by the amazing margin of 50%!

Both crawlers are working under identical conditions. Both are ripping and stripping overburden for the Luttjohann Stone Co., near Topeka, Kansas.

The decisive difference is: the TD-24 has "live" power on both tracks all the

overburden!

Topeka, Kansas

time. Planet Power steering eliminates load-limiting "dead-track drag." You don't "half-kill" your power and traction to guide the TD-24—as you must with any king-sized steering-clutch tractor. You can even "equalize" TD-24 track speed to steer accurately with big offset loads!

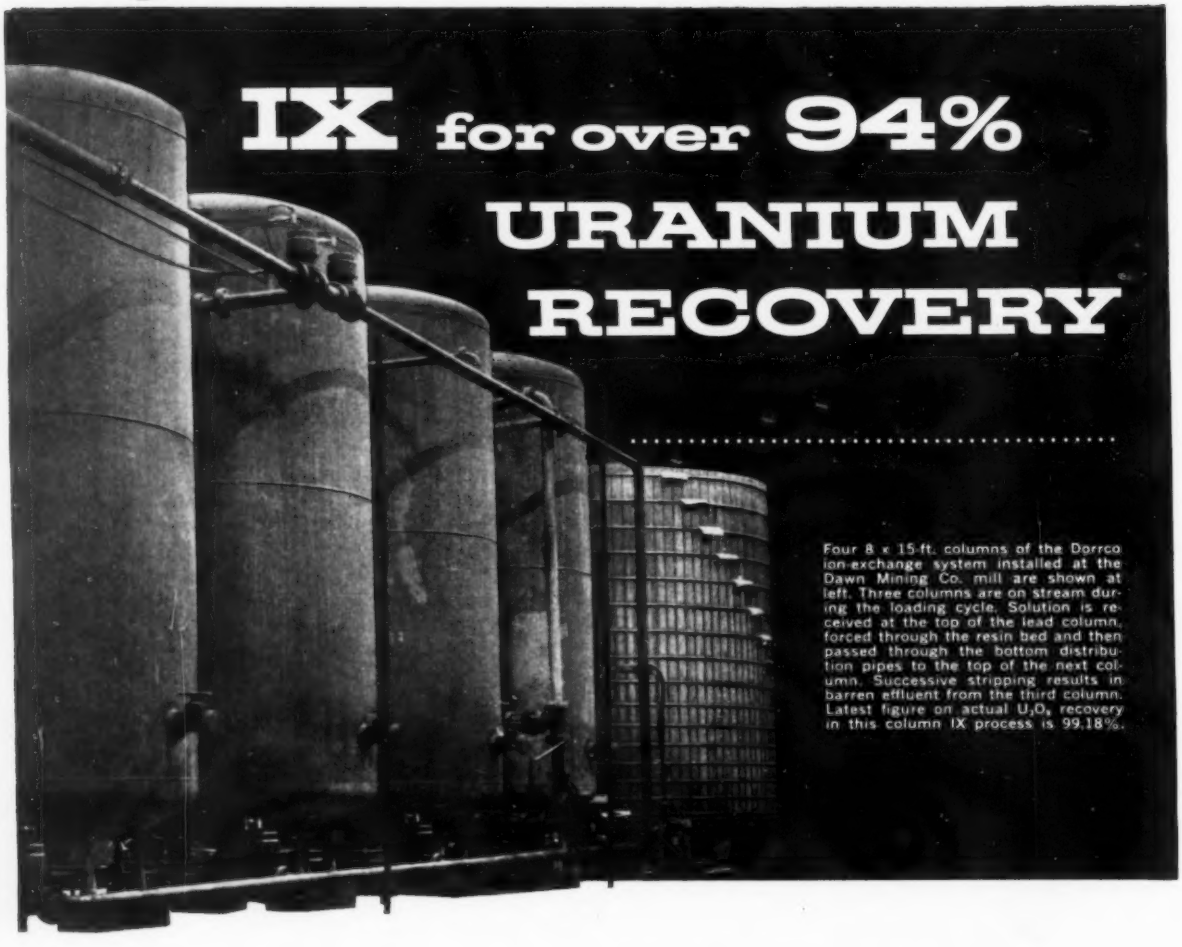
Both king-sized crawlers cost approximately the same to buy and operate. But the TD-24 Torque-Converter does half-again as much as the other rig!

Prove to yourself what a tremendous profit-earning advantage the Planet Power-steered TD-24 gives you over anything else on tracks. Compare the huge capacity increase Planet Power steering delivers on benching, whether on turns or straightaway. Add up the extra 'dozing passes you get per day from exclusive Hi-Lo shifting—and from high TD-24 reverse speeds. Ask your International Construction Equipment Distributor for your demonstration!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.



IX for over 94% URANIUM RECOVERY

Four 8 × 15-ft. columns of the Dorrco ion-exchange system installed at the Dawn Mining Co. mill are shown at left. Three columns are on stream during the loading cycle. Solution is received at the top of the lead column, forced through the resin bed and then passed through the bottom distribution pipes to the top of the next column. Successive stripping results in barren effluent from the third column. Latest figure on actual U_3O_8 recovery in this column IX process is 99.18%.

new Dawn Mining Co. mill equipped with DORRCO ION-EXCHANGE SYSTEM

One of the most successful ventures in the field of uranium extraction in the new 440-ton mill of the Dawn Mining Co., near Ford, Washington. Using the ion-exchange process, the plant has achieved better than 94% overall recovery. The ion-exchange system along with other process equipment, was supplied by Dorr-Oliver.

The design of efficient ion-exchange systems to meet complex and widely varying requirements of the mining and other industries is but one of the services offered by Dorr-Oliver. In the case of ion-exchange systems every installation is individually designed and developed for maximum utilization of cell volume, most efficient use of resins and uniformly high performance despite the many fluctuating factors in operating cycles.

Complete Dorr-Oliver service which may be brought to bear on any plant engineering problem includes laboratory testing, pilot plant proving to determine operating factors and equipment sizes, economic analysis, plant design specifications, responsibility for plant construction and supervision of initial operation, together with personnel training.

For complete information on Dorr-Oliver services, contact Dorr-Oliver Inc., Stamford, Conn. Ask for Bulletin 7003.

Dorrco—T.M. Reg. U.S. Pat. Off.

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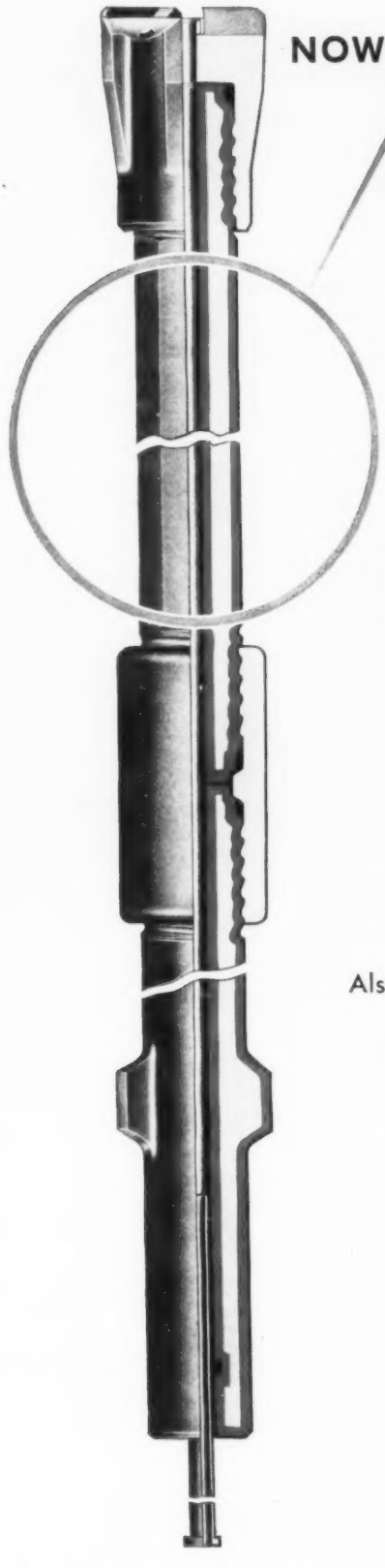
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U. S. A.



NOW CARBURIZED DRILL STEEL life that is

MEASURED IN MILES*

on the job performance proves lower cost per foot of hole when you use the ALL I-R Deep Hole Drilling Combination

* More than *6 miles* of hole with a single steel! That's the record chalked up by an I-R Carburized Alloy Steel Rod on a Montana construction project. This "super" steel broke after 32,307 feet. Another piece broke at 24,400 ft. and another at 15,000 ft. Performance like this on hard rock, deep hole drilling jobs is the result of Ingersoll-Rands improved Carburizing process. Every steel is specially treated to provide exactly the *right combination hardness* and *core toughness* to withstand billions of heavy impacts without molecular fatigue.

And what about *bit* performance? On the same job, in hard basalt, customer keeping accurate records reported an I-R Carset bit that drilled 4,065 feet on *one* regrind. On second regrind insert still looked good with considerable footage left in the bit. Bits used were I-R non-rifling type 60X face design available in 2½", 2¾", 3" and 3½" sizes.

This is further evidence that it *pays* to use the ALL I-R Deep Hole Drilling Combination.

Carburized Shank Piece gives extra strength and wear resistance where it is needed most.

Semi-Bridge Couplings assure proper alignment between sections—permit deep hole drilling without pulling steels.

Also CARSET BITS

with Type 40 or Quick-Change I-R Type 22 Threads

Inserts, shoulder, clearance, and skirt all correctly designed for highest sustained drilling speed and maximum bit life. Available with either the Type 40 Thread or with the Quick-Change Type 22 Thread, especially designed for faster and easier detachability.

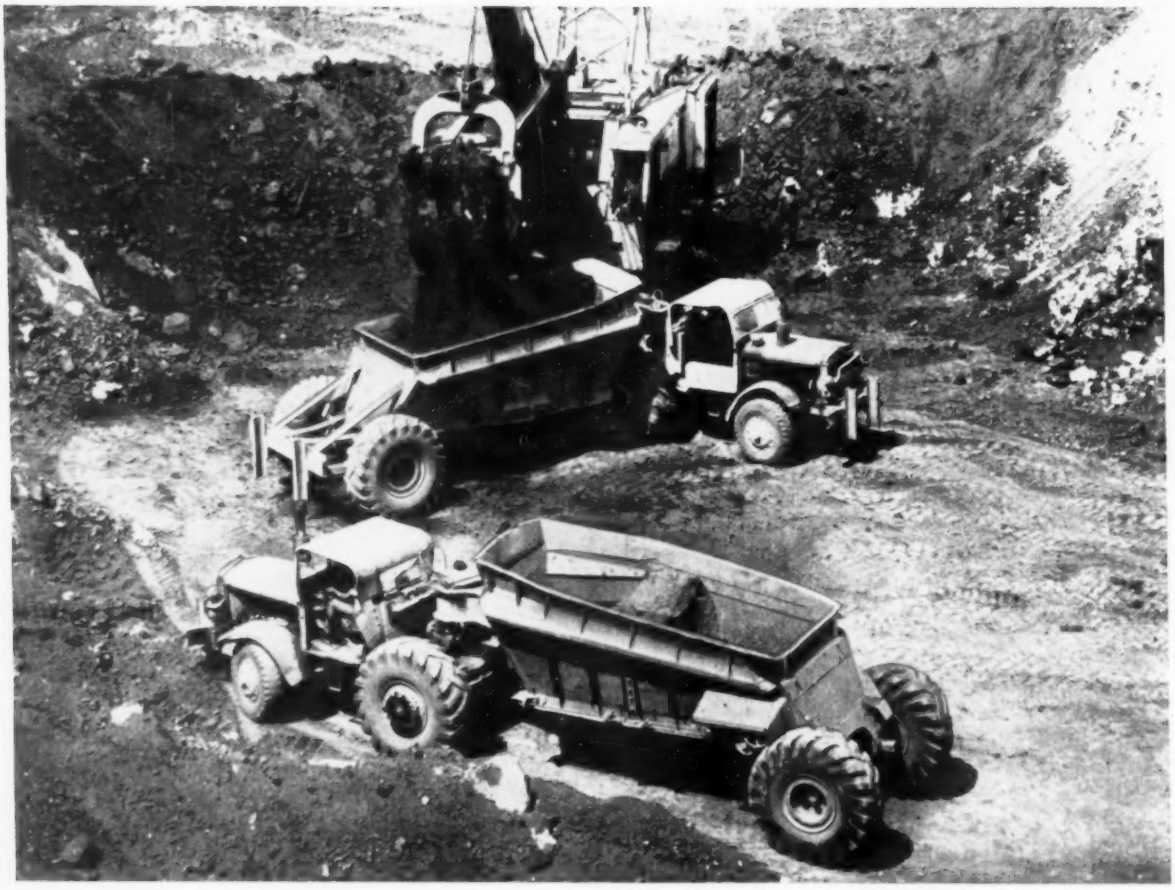
Thread	Description	Bit Sizes	Net Weight Lb.	Net Weight Oz.
Type 40	1¼" O.D. Thread, 3½ threads per inch	2"	1	2
		2⅛"	1	5
		2¼"	1	8
Type 22	1¼" O.D. Thread, 3 threads per inch	2"	1	2
		2⅛"	1	5
		2¼"	1	8

For complete information, or for an eye-opening trial order, call your Ingersoll-Rand man as soon as you can.

Ingersoll-Rand

15-841 11 Broadway, New York 4, N.Y.

A CONSTANT STANDARD OF QUALITY IN EVERYTHING YOU NEED FOR DRILLING ROCK



5 years of dependable performance at big bauxite mine in JAMAICA

The mining and export of bauxite ore for the production of aluminum is a major industry in Jamaica . . . one that is making an important contribution to the economic progress of this historically famous Caribbean island.

Reynolds Jamaica Mines Ltd. is one of the largest operations, shipping over a million tons of ore annually to plants of Reynolds Metals Co. in the United States. The red ore is loaded by big diesel power shovels into a fleet of 15 Euclid haulers — eight Bottom-Dumps of 15 cu. yd. capacity, and 7 Rear-Dumps that carry 22-ton payloads.

Hauls from the pits to the stockpile area are up to 7000′ in length — over marl-base roads cut through the tropical country — with adverse grades up to 6%. The "Eucs" make the one-way haul in an average of six minutes and work around the clock on a 3 shift 5 day week operation to feed the kilns and 6 mile overhead tramways to the ship docks in Ocho Rios.

The Euclid fleet has been on this continuous, rugged operation for 5 years and has maintained full production requirements. Excellent maintenance, combined with the built-in dependable performance of Euclid design, has resulted in very high machine availability for Reynolds Jamaica Mines.

For helpful facts and figures on how Euclid equipment — rear-dumps, bottom-dumps, scrapers and crawler tractors — can cut costs on your mine, quarry or construction jobs, contact the Euclid dealer in your area or write:

Engineered to fit the job . . .
Euclids are your best investment

GM GENERAL MOTORS EUCLID

EUCLID
Division of General Motors Corporation
Cleveland 17, Ohio

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

AEROSOL® OT *Surface Active Agent Cures "Sticky Froth" Problem in Sphalerite Flotation*

A zinc mill in the eastern United States had a very unusual operation problem in the flotation section.

Lowest cost-plus-tails were achieved by a reagent combination comprising 0.7 lb/ton SODIUM AEROFLOAT® Promoter and 0.1 lb/ton AEROFROTH® 77 Frother with 0.5 to 0.75 lb/ton $CuSO_4$ as a zinc activator and 0.03 lb/ton NaCN plus 0.6 to 0.9 lb/ton of lime as pyrite depressants. Flotation froth, however, was "sticky", voluminous and difficult to control. Reagent combinations which produced more controllable froth were less efficient.

A Cyanamid Field Engineer diagnosed the difficulty as the possible result of a reaction between the $CuSO_4$, soluble salts and interfering slimes in the flotation feed which had a stabilizing effect on the froth. Laboratory tests showed that adding only 0.10 lb/ton of AEROSOL OT-75% Surface Active Agent controlled the slimes and produced a small-bubble, easy-to-control shallow froth.

AEROSOL OT is available both as a solid and as a 75%-solids aqueous paste which is easy to handle and dissolve. Write for our bulletin on the AEROSOL Surface Active Agents for further information on this and other AEROSOL products.

* * * * *

In their constant world-wide contacts with every type of precious and base metal operation, Cyanamid Field Engineers accumulate a vast amount of reagent application knowledge which is available to present and prospective users of Cyanamid Reagents in the solution of difficult beneficiation problems. Feel free to call upon us for technical help as well as your reagent needs.

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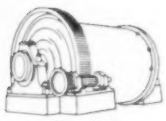
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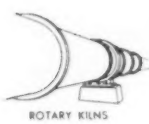
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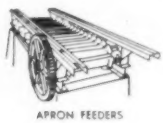
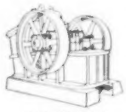

APRON FEEDERS

PRIMARY GYRATORY CRUSHERS


JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS

Building a new haul road at this Kentucky, U.S.A. pit, modern B Tournapulls with 27-yd Fullpak scrapers heap big loads of sticky clay fast. The machines' easy maneuverability plus high travel speeds permitted faster cycles and helped lower production costs.

A sure way to lower stripping costs

When stripping overburden, building haul roads, or leveling camp and drill sites, fast, high-production earthmovers can help greatly in keeping your costs down. That is why so many pit owners rely on LeTourneau-Westinghouse Tournapull scrapers. These versatile machines heap big loads quickly, haul anywhere, and spread fast. Here are 4 reasons for their outstanding performance:

1. Most power used for cutting

When loading, the 27-yd Fullpak scraper wheels roll inside the cutting width, hold the bowl low, and the material flows into the scraper at a 1° angle. Because the earth enters the bowl almost horizontally, there is little effort wasted in lifting the material, and the scraper heaps big loads fast, packs in the last yard almost as easily as the first.

2. Easy loading in difficult conditions

The high apron-lift permits fast loading and unloading of chunky materials. The quick-release clutch on the hoist-motor makes it possible for your operator to move the bowl up and down rapidly, to get big loads in loose material. The streamlined bowl makes it easy to load next to vertical banks and around obstructions.

3. Poor footing no barrier

When using Tournapull scrapers, there is seldom need to stop work because of bad weather, or to extend your haul distance to bypass mud, sand, and soft footing. The prime-mover has an exclusive power-transfer differential that automatically slows the spinning wheel and transfers up to 4 times the power to the wheel on firmest footing. The LeTourneau-Westinghouse differential works *continuously*, on turns, through mud and sand, over rough, uneven ground. This gives you better traction throughout every haul cycle, for faster stripping, roadbuilding, or other earthmoving assignments.

4. Unloads all material fast

The scraper's positive-ejection tailgate moves straight forward with full power on the thrust. There is no need to lift the load. The tailgate has plenty of power to force out sticky clay, mud, or rocks. The inside of the bowl has no angular obstructions to block the flow of material. The tailgate is operated by electric power. There are no springs, no gears and mechanical parts to wear. You will find that modern LeTourneau-Westinghouse Tournapull scrapers complete cycles faster, give profitable production on any earthmoving and material handling work. You have a choice of 3 scraper sizes, with capacities of 9, 18, and 27 yd.

Convert earthmover to rugged rock-hauler

For less than ¼ of the cost of the Tournapull prime-mover with scraper, you can add a Rear-Dump trail-unit to interchange with the original scraper behind the same prime-mover. In dump position, as shown, the 35-ton B Rear-Dump makes 180° turns in 27 ft. In travel position, the machine turns in 35 ft. Rear-Dump's all-steel body with 3-layer steel bottom withstands the pounding of heavy rock. The unit dumps smooth and clean over the edge of the bank, hauls anywhere.

Tournapull, Fullpak—
Trademark Reg. U.S. Pat. Off. P-1835-MQ-1r

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Kaiser Selects an AKINS HMS Separator For Iron Ore

The Kaiser Steel Corp. made extensive tests using an Akins HMS Pilot Separator to improve the operation of its Eagle Mountain heavy media plant. As a result an 84″ Akins Separator was installed to handle 300 tons per hour.

90% Recovery

This hematite iron ore contains a considerable amount of magnetite residual after magnetic separation. The iron content of the heads is sometimes as low as 25 per cent Fe with an average of 37 per cent Fe. The concentrates average about 60 per cent Fe with tailings of about 10 per cent Fe. Iron recovery averages better than 90 per cent.

When iron content of heads increases, a middlings product, containing better than 20% iron, is drawn, recrushed, and returned to a jig circuit, further increasing recovery of iron. With the Akins Separator this is accomplished with just one medium circuit.

Akins HMS Pilot Testing Units *are available for purchase or rental.*

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NOW THERE ARE 7*

ANNOUNCING

the newest model in the LeTourneau-Westinghouse Adams grader line

the 135-hp POWER-Flow 550 with torque converter

- **Forward speed to 26.4 mph, reverse to 23.5 mph**
- **Power and speed automatically proportioned to meet all working conditions**

Now, to give you an even more complete selection of Adams motor graders, LeTourneau-Westinghouse has added a seventh high-speed machine to its series. It is the new, heavy-duty POWER-*Flow* 550 grader with torque converter.

The introduction of this new 135-hp LeTourneau-Westinghouse grader allows you to choose with greater accuracy the right motor grader (heavy-duty, general-purpose, or utility) for your mining requirements.

With its single-stage torque converter, the new POWER-*Flow* 550 grader automatically balances speed and applied power to match your varying load; automatically apportions the engine drive to provide more power, or speed, as needed in your grading work. This means that the LeTourneau-Westinghouse POWER-*Flow* grader handles every assignment at the fastest possible speed, and with greatest efficiency.

Reduces gear-shifting and wear

Delays due to stalling are ended. When pushing heavy loads in your pit or mine, the need for frequent gear-shifting is eliminated. The operator does more work with less effort. The torque converter also shields the transmission and power-train from damage caused by shock loads, reduces wear and maintenance expenses.

Shifts instantly

In any gear range, the POWER-*Flow* 550 power-shifts instantly (from forward to reverse, reverse to forward) by the simple movement of a rocking treadle-type foot pedal. This leaves the operator's hands free for steering, or to manipulate other controls.

Cutting ditches, shaping shoulders, sloping banks, spreading fill, final grading, maintaining roads, plowing snow: on all these assignments, the 135-hp POWER-*Flow* 550 grader will keep your work ahead of schedule. Write us for complete details on the 550 POWER-*Flow* motor grader.

OPTIONAL EQUIPMENT — available for POWER-*Flow* 550 are Power-Shift Moldboard, Scarifier, Cab, Bulldozer, Push Plate, Jebco Elegrader, V-type Snow Plow and Wing, and Snow-Blo Wing.

Check these other important features of the LeTourneau-Westinghouse 550 POWER-Flow

- **Power Steering (optional)** — You retain the "feel" of hand steering, with hydraulic power doing the work.
- **Double-Action Hydraulic Braking System** — Pedal-operated service brake automatically applies pressure to transmission brake, as well as to 2 tandem drive-wheels.
- **Rubber-Mounted Engine** — Reduces vibration transmitted to the machine, resulting in less wear on equipment, less operator fatigue.
- **Foot Accelerator** — Even in heavy traffic, driving the 550 POWER-Flow grader is as easy as driving a truck. Foot accelerator or hand throttle may be used when working.

*Complete LeTourneau-Westinghouse Adams line of graders include: 190-hp POWER-*Flow* 660, and 135-hp POWER-*Flow* 550 with torque converters; with standard transmission: 160-hp "660", 123-hp "550", 115-hp "440", 80-hp "330", and 60-hp "220" utility grader.

Choose between Cummins and General Motors diesel engines on the six larger models.

Adams—Trademark; POWER-*Flow*—Trademark Reg. U.S. Pat. Off. G-1912-G-1r

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

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Where quality is a habit

NEW AMSCO 2-PART TOOTH

Special-alloy reversible tips *(easy to reverse)* nearly double tooth digging life...

In quarry work, in cold and hot slag pits . . . in the roughest of digging tests, these new Amsco® 2-part Simplex teeth have outlasted competitive 2-part teeth more than 2 to 1 . . . at a big saving in tip and adapter replacement time.

You get this longer wearing quality because of the special, rugged alloy used for both tip and adapter. Reversing tips extends digging life even more, yet takes only a few minutes.

Adapters outlast several sets of tips, are equally easy to replace. Pin lock between tip and adapter seats and locks so securely, metal-to-metal, that even side blows can't jar it loose.

We'll be glad to send you a booklet containing reports by Simplex users and describing this new Amsco tooth completely. Write for it today.

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WALKER WORKS 'ROUND-THE-CLOCK UNCOVERING BAUXITE . . .

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Marion manufacturers a complete line of excavators from ¾ to 75 cubic yards

This Marion 7400 walking dragline is a dependable performer for its owner—a large aluminum company. It works 'round-the-clock, five days a week stripping overburden and stacking it in previous cuts as backfill. The overburden is 60′ to 150′, consisting of sand, gravel, lignite and clay. The walker is equipped with a 200-foot boom that carries a 10-yard bucket. Location of the bauxite mine is in Arkansas.

Consult Marion Mining Specialists for Lowest Costs on Your Property.

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

July 1958

INTERNATIONAL PANORAMA

LAC JEANNINE, CANADA—United States Steel Corporation's subsidiary, Quebec Cartier Mining Company, will build a 193 mile long railroad, a St. Lawrence River deep water port, a 60,000 horsepower hydroelectric plant, develop an open pit iron mine, and build a beneficiation plant capable of producing 8,000,000 tons of high grade concentrate a year. Concentrate will be either sold or used by United States Steel in the United States, Canada, and Europe.

MOAB, UTAH—Shattuck Denn Mining Company will sink an 800 foot shaft to develop a uranium ore body in the south end of the Big Indian district.

WALLACE, IDAHO—Coeur d'Alene district mining companies and civic officials have celebrated the 75th anniversary of silver production in this great mining center.

WHITE PINE, MICHIGAN—The Bear Creek Copper Company has applied for leases to prospect for copper on 933 acres of Porcupine Mountains State Park and 5,260 acres of Lake Superior bottom.

MONTREAL, CANADA—Iron Ore Company of Canada, largest Canadian iron miner plans to ship 9,500,000 tons of ore in 1958 and has scheduled a $1,000,000 exploration program in Labrador's Wabush Lake area.

BEAUMONT, TEXAS—The Texas Gulf Sulphur Company has started sulphur production from its new Fannett Dome mine. Production is set at 500,000 annual tons of sulphur. This is the 12th United States Frasch producer.

HAYDEN, ARIZONA—Ray Mines Division of Kennecott Copper Corporation has started its new copper smelter here. This new smelter is a key step in Kennecott's integration program.

PUERTA PRINCESA, PHILIPPINE ISLANDS—Palawan Quicksilver Mines INC. has started its third mercury kiln. Furnacing capacity is now 240 tons per day.

BER AUKUS, South West Africa—Exploration by the South West Africa Co., Ltd. has disclosed 500,000 tons of lead vanadate ore to a depth of 600 feet.

PORT PIRIE, AUSTRALIA—Production of high grade blast furnace feed from Middleback Range taconite is under study by Broken Hill Proprietary Co., Ltd.

JOHANNESBURG, UNION OF SOUTH AFRICA—The Combined Development Agency has set a ceiling on purchases of South African uranium at 6,200 annual tons of oxide per year from 1 July 1958. The Agency buys for United States and British governments. Any excess production may be sold under license on free market.

HURLEY, NEW MEXICO—Kennecott Copper Corporation's Chino Mines Division has awarded a $3,000,000 power plant expansion to J. F. White Engineering Corporation.

JEFFERSON CITY, TENNESSEE—Putman Exploration Company's diamond drilling program hit zinc ore on the Treadway Trend in eastern Tennessee during May.

JEFFREY CITY, WYOMING—Western Nuclear Corporation is making commercial sales of uranium concentrates to United States chemical firms following the recent Atomic Energy Commission's free market announcement.

BAGUIO, Republic of Philippines—Philex Mining Corporation has started its new 2,000 ton per day mill here to treat copper-gold ore from its Santo Tomas mine.

Fremont Starts To Build Sulphuric Acid Plant

Fremont Minerals, Inc. has started construction of its 125-ton-per-day contact sulphuric acid plant at Riverton, Wyoming. The acid plant, being built by Leonard Construction Company, will be located adjacent to Fremont's 500-ton-per-day uranium concentrator now being built by Western Knapp Engineering Company. Feed for the acid plant will consist of sulphur recovered from sour gas produced from fields near Thermopolis, Wyoming. The acid will be consumed in Fremont's milling installation which will contain both acid and carbonate leach circuits. Acid will also be available for sale to other uranium milling installations in the area.

The solvent extraction process will be used at Fremont's uranium mill. At the end of May, most of the footings for the plant had been completed. It is expected that initial tuning of the concentrator will take place late in December of this year.

Philex Begins Production From Santo Tomas Project

Philex Mining Corporation began operating its Santa Tomas mill in Mountain Province, The Philippines, recently with initial capacity of 2,000 tons daily.

The mill, which is one of the most modern in the Philippines, utilizes three 750W Diesel electric generators for power, and a 10 by 10 Marcy ball mill for grinding. The mill has been constructed so that capacity can be doubled merely by adding a second Marcy mill and additional flotation cells. Remote control and automatic recording have been installed to reduce operating crews and allow maximum economy.

At the mine, the ore pass from the main haulage level to the surface has been completed. Most of the ore will be mined in the open pit and delivered to the main haulage level through this ore pass for several months. Ore will be hauled to the mill by a Diesel locomotive. While the open pit is in production, the block caving system will be prepared and two blocks are expected to be ready for delivery of ore within six to nine months. A test block prepared several months showed that ore caved satisfactorily and fragmentation was good.

The Santo Tomas operation, working at full capacity, is expected to bring from $3,000,000 to $3,600,000 annually from gold and copper deliveries. Philex has signed a contract with the Nippon Mining Company of Japan for the sale of the entire production of copper from the operation.

In August—How Use of Roadbinder Saves Money at Chino Mines

London Letter

From Max F. Holsinger

It was just one year ago that Max F. Holsinger, general manager of MINING WORLD, boarded an airplane at Idlewild Field and flew off to Europe. He has travelled extensively in Europe since then and made one fast trip back to the United States to bring the Blue Ribbon Equipment entries for 1957 of the latest European machinery developments. Here he is at the Hanover Industrial Fair.

Yes, he has been busy, but he hasn't forgotten all his associates, friends, and contacts here at home. His latest report came at an opportune time with the announcement of permanent European staffing for MINING WORLD. So much is happening in mining that the Editors believe that this letter is a good way to update readers on both Max Holsinger and MINING WORLD.

The unexpected opportunity and privilege of an informal chat with Harry Oppenheimer, son of the late Sir Ernest and Chairman of the mighty Anglo American Corporation of South Africa Limited, has prompted me into writing this letter despite the press of other matters generated in my trips to the Hanover Industrial Fair in West Germany and to Scandinavia. Together with Mr. Oppenheimer were managing director W. D. Wilson, and Rhodesian director K. C. Acutt.

The occasion was a closed meeting with a small group of business and financial editors in London just prior to the release of Anglo American's annual report. The informal chat followed, and unfortunately some of it will have to remain off the record, at least for the present.

Here are a few reportable highlights. I consider them as providing at least a fair clue to the future. Also in lending substance to the growing belief here that the present conditions in the United States cannot prevail for long; that both domestic and foreign mining will soon be called on for greater production.

These facts and impressions are set forth in the order in which they were gained regardless of relationship to each other:

PLANS—Anglo American is proceeding with full confidence on a host of new projects; exploration continues, and development work is underway.

DIAMONDS—A paradox in the odd United States recession is found in Europe. Gem demand is up for the first quarter of 1958 after a falling off late in 1957 in the face of a sharp drop in industrial diamond demand in the United States. Intensive prospecting for unknown deposits continues unabated over much of southern Africa.

COPPER—The feeling here is that the current copper price cannot bring out the production necessary to meet even the present rate of demand. Future copper use should start spiralling in the 1960's, and this explains why most long-term copper projects never have been appreciably slowed during the adjustment period.

The much discussed ideal "fair" price of copper of about £240 per metric ton (30.00 cents per pound) appears to live up to its name. At this level, known and accurately forecastable requirements can be met and no major substitutions by other metals can take place.

GOLD—Once again gold is contributing greatly to the stability of Anglo American, other African companies, and the African economy. It has provided a stabilized base, helped by increased mining efficiency and lower costs, during a period of industrial fluctuation when prices for many other commodities have declined.

URANIUM—A little better than a third of Anglo American's working profits last year were from uranium. With uranium plant costs written off by the time the 10-year contracts run out, South African producers will be well equipped to hold their own in any kind of open market that may exist.

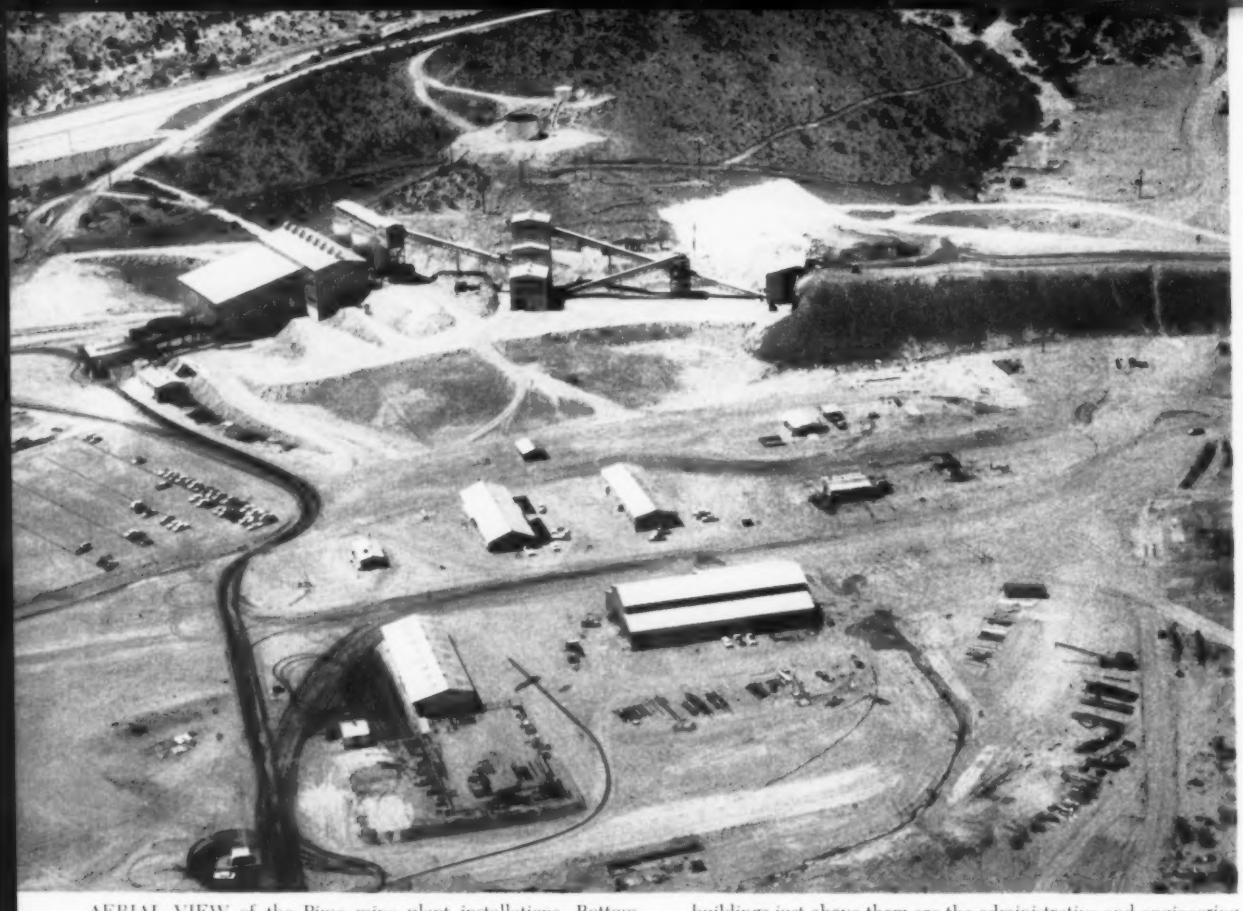
FUTURE CAPITAL REQUIREMENTS—A marked increase in United States holdings of mining shares is apparent. This capital probably will continue to play an increasing role in the future of South Africa. However, inadequate availability of capital from the United Kingdom doesn't imply a need for shifting to the United States. No problem is foreseen with regard to restrictions on export of capital from South Africa.

PROSPECTING AND DEVELOPMENT—Prospecting for diamonds is underway in the Union of South Africa, South West Africa, and Federation of Rhodesia and Nyasaland. Prospecting for other metals and minerals, including iron ore, has been focussed on Swaziland, Southern Rhodesia, and Tanganyika.

Latest electromagnetic equipment has been installed in the company's prospecting air planes. Various combinations of prospecting techniques are being used with a view to pinpointing mineralization in smaller areas. A competent geophysical interpretation staff is kept busy in Johannesburg.

WHAT DOES ALL THIS MEAN?—To me, all this adds up to a mighty promising picture concerning the way the mining industry is planning for the demands that will soar in the early future.

Max F. Holsinger



AERIAL VIEW of the Pima mine plant installations. Bottom two buildings house Pima's extensive maintenance facilities and buildings just above them are the administrative and engineering offices. Concentrator is in the background.

Geophysics, Skip Hoisting Signify

By HENRY G. GRUNDSTEDT
Manager, Engineering Services

Here's one of the latest open-pit copper mines to come into production. And one of the first to be discovered by geophysics. This is not the only first to be credited to Pima. Credit also the first skip hoisting system for nonferrous open-pit mines, and the first United States copper concentrating plant to use cyclones exclusively for classification. Modern, up-to-date methods have been used by the Pima Mining Company—from discovery, through the actual ore concentration.

Credit for initial discovery work goes to United Geophysical Company which became interested in a program of development in mining exploration.

First a review and search of geological literature was made. Field checks were then made of the most promising areas. And finally the Pima mining district in southern Arizona was decided upon. This district had all the qualifications the United engineers were interested in. It was in an area having a long productive history (total production up to that time is valued at over $20,000,000 in copper, lead, zinc, silver, gold, and molybdenum). Further delineation placed the spot in the Mineral Hill area. See MINING WORLD, October 1954.

Mineral Hill Geology

Two blocks of sediments make up Mineral Hill. They are separated by a major thrust fault striking nearly east-west and dipping approximately 30° to the south. Ore deposits in the area occur in favorable sedimentary members along the fault zone and in close proximity to igneous rocks. Deposits are typical contact metamorphic in that there is more or less normal contact-zoning of the high temperature gangue and ore minerals.

The apparent primary control of the Mineral Hill deposit was a major thrust fault zone striking east-west. Therefore it was logical to assume the possibility of a continuation of the thrust fault, under alluvium, to the east of Mineral Hill. And that this fault would conceivably cut favorable sediments again. As a result of the possibility of ore deposits under the alluvium, it was decided that the area east of Mineral Hill would be ideal for geophysical prospecting.

The Application of Geophysics

Initial investigation of known deposits in the area indicated that ore and associated gangue minerals possessed enough physical contrast with the surrounding country rock to support geophysical prospecting methods.

Tests indicated that zones of magnetic concentration could be detected with a magnetometer to depths of 200 to 300 feet. As much of the known ore had been found in association with such magnetic zones, it was decided to make limited tests with a magnetometer first, and, if successful, more extensive surveys would be made.

An important magnetic feature was delineated on the eastern, alluvial-

NEW PIMA OPEN PIT looking southeast. First skip hoist-system in a southwest non-ferrous mine may be seen in the lower left hand corner. The pit currently produces approximately 4,000 tons of copper ore per day.

New Mining Trends Set by Pima Mine

covered flank of Mineral Hill. This was in an area where prior geological interpretations seemed to have indicated good ore possibilities. At this point it seemed advisable to use still another geophysical method to corroborate the information already in hand, before any drilling was started. A study of the magnetic anomaly already delineated, along with data obtained by geological extrapolation and resistivity depth probing, indicated a depth of 210 feet to the upper surface of the ore body, plus, or, minus-25-percent (actual drilling later proved depths ranging from 205 to 215 feet). This was too deep for good gravity results. Therefore, an electromagnetic method with a penetration and resolution to at least 300 feet was decided upon. Electro-magnetic equipment was designed according to established procedures and conventional principles.

An electromagnetic high was obtained which compared very favorably with the magnetic high obtained on the eastern flank of Mineral Hill.

Initial drilling was started in the anomalous areas suggested by the magnetic survey and confirmed by the electromagnetic data. Before any results were obtained from the drilling operation, geophysical interpretations suggested that the ore body was a lenticular-shaped deposit dipping steeply to the south and striking nearly east-west. Data also indicated that the upper surface of the ore was approximately 200 feet deep.

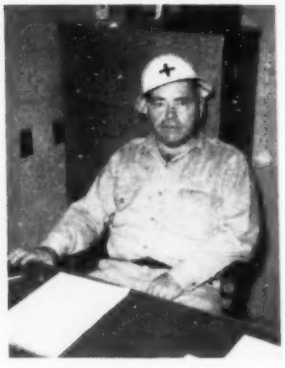
The first drill hole encountered oxidized mineralization at 209 feet. Sulphide ore was penetrated at 255 feet.

Exploratory Drilling

Results from the first drill hole were encouraging enough to warrant a systematic exploratory drilling program. A total of 18 holes were drilled. Due to the depth of alluvium, oil well drilling methods were used, and worked quite satisfactorily. Drill holes were spotted from information obtained from the magnetic contour map. The holes indicated that copper mineralization was present, and the size and extent of the mineral body, as determined by the drilling program, were found to confirm the results obtained from the geophysical survey. Overall drilling results were good enough that a report was prepared recommending the sinking of an exploration shaft to 400 feet, to explore the ore zone on the 300 and 400 levels.

Underground Phase

November 1951 saw the Pima Mining Company formed, to carry out the underground program. In December the surface plant was started, and a contractor was engaged to start the shaft January 1, 1952. By May a station was cut on the 400 level, and both the 300 and 400 levels were explored by drifts. Results were encouraging. Diamond drilling was started in a downward direction, and results were good enough to continue the shaft on downward to the 500 and 600 levels. By April 1953 the shaft



HERE ARE SOME of the men at Pima with a hand in the operation of the mine. Looking from left to right are: BOB THURMOND, general mine superintendent and one of the original discoverers of the property; JIM OLK, chief mining engineer, NICK NICHOLSON, maintenance superintendent and ALEX MONROE, safety engineer.

was complete, with stations on the 500 and 600 levels. Additional exploration drifts were driven on these levels, along with vertical development and stoping.

Although only a small amount of stoping was actually done, the work was undertaken for three reasons:

1. To gain additional information about the ore body.
2. To experimentally determine on applicable stoping method if the ore body were to be mined by underground methods.
3. To supply enough ore for direct shipment to pay development and exploration costs.

Due to a rather weak hanging wall, a definite method of ground support was decided upon. For the preliminary stoping, square set slots, two to three sets wide normal to the strike were laid out, with 10-foot pillars left between adjacent slots.

Soon after this (August 1955) Cyprus Mines Corporation exercised its option and took over management of Pima Mining Company in conjunction with Union Oil Company and Utah Construction Company, who each have a 25 percent interest.

The Pit

Subsequent studies and additional drilling of the low-grade material surrounding the high-grade ore body increased reserves and proved that the ore body could be worked profitably by open-pit methods.

Because the ore body is relatively small and narrow, compared to most open-pit mines, it became apparent that stripping requirements would be very high. Also, the ore is deep, compared to its lateral extent, and this brought up a transporation problem.

Early in the studies of the pit layout and operation, much consideration was given to the use of a slope hoist as a means of reducing stripping requirements. In order to use an exclusive truck haulage system, with roads of proper grade, an additional 100 feet of stripping would have to be done beyond established stripping limits. The actual installation of a rock-over skip system eliminated this extra expense.

As can be seen from the overall photo, the Pima pit is an oval-shaped excavation, with the long axis parallel to the strike of the ore body. The north side of the pit (hanging wall) is carried as the final slope, while the remaining three walls are being continually stripped back toward their final slopes.

An access road, with a 5 percent grade, provides entrance to the northeast corner of the pit. This road is part of the pit ramp system, and continues on its 5 percent grade down to the base of the alluvial cover. At this point, the ramp system is steepened to a 12 percent down grade to the pit bottom. Scraper haulage out of the pit is facilitated by the 5 percent grade in the alluvium. There are also several other temporary working ramps, which provide a shorter haulage distance to dump areas. The temporary ramps are left on top of working benches and therefore do not alter overall working slopes. Haulage within the pit is by trucks, going either up or down to the skip hoist loading point.

DEEP PIT WITH NARROW BENCHES means a large amount of clean up and road clearing before loading equipment can be moved into place after blasting. This new Westfall Performer rubber tired dozer is used for this service.

Pit Slopes

Final pit slope is 1.2 to 1 with 50-foot bank heights. Bank slopes are 0.6 to 1 with 20-foot benches except at the base of the alluvium. Here an 85-foot bench was left for protection from excessive sloughing. Final slopes in the rock are 1 to 1 with 40-foot bank heights, 0.375 to 1 bank slopes, and alternate 10-foot and 40-foot bench widths.

Working slopes in the alluvium are kept at 1.35 to 1 with alternate 25-foot and 50-foot benches. Bank slopes and

heights are kept the same at the final pit slope. Rock working slopes are usually held at 20 to 1 with 50- to 60-foot benches, 40-foot bank heights, and approximately 0.5 to 1 bank slopes.

Stripping

Stripping was started by Utah Construction Company in November 1955. Using MRS tractor units with 34-yard Wooldridge scrapers, a shovel truck combination of Marion 151-M shovel, and four LLD Euclid trucks, over 6,000,000 cubic yards of material were removed by October 1956. Pima Mining joined in the stripping operation along-side the contractor in April 1956, and by January 1957, when official production started, a total of over 9,000,000 cubic yards had been removed. Slightly over 1,000,000 cubic yards of this material were rock, the balance being alluvium. Currently the stripping ratio is about 3.0 cubic yards of waste per ton of ore. Stripping ratio for the remaining life of the mine should be in the vicinity of 2.6 cubic yards of waste per ton of ore. Additional stripping is currently taking place on the east and south sides of the pit.

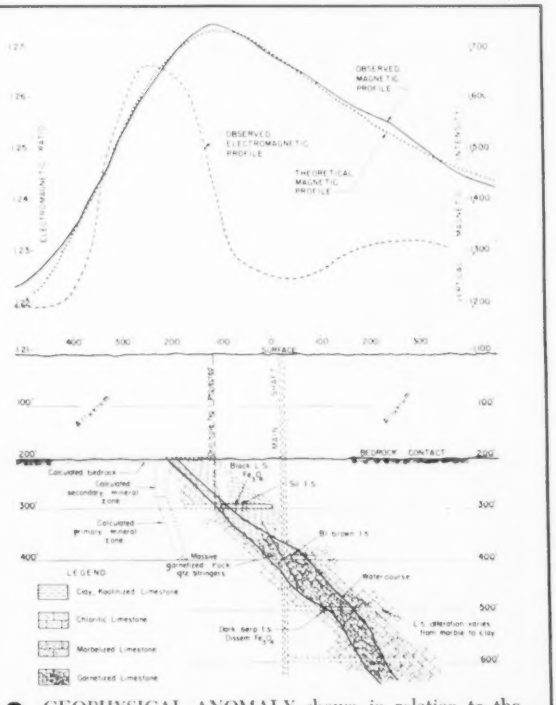
Initial drilling is done with one Bucyrus-Erie rotary drill working two 8-hour shifts each day. Using Hughes W-7-R Aero type Tricone Bits, an average of 350 feet of 9-inch hole is drilled per shift. Depending upon the rock, bit life varies from 1,500 to 4,000 feet.

For the purpose of drilling and blasting procedures, engineers at the mine have categorized the ground to be broken into three types: A dense, nonfractured conglomerate, easy to drill, but hard to fragment; a brittle, highly fractured, hanging wall rock, easy to fragment but rather hard to drill; and an altered carbonate rock, host to the high-grade mineralization, which is also rather difficult to fragment and hard to drill, depending

How Mining Geophysics Found Deeply Buried Pima Ore Body

1 HERE IS WHAT THE PIMA MINE looked like prior to any stripping operations. Photograph shows the top of the 200 feet of alluvium which was subsequently removed. Mineral Hill is in the left background.

2 TRUCK MOUNTED continuous recording, total intensity magnetometer bridged the gap between a slow tripod mounted instrument and the airborne magnetometer. Much early geophysical work at Pima was done with this unit.



3 GEOPHYSICAL ANOMALY shown in relation to the actual ore body. Note magnetic high almost directly over ore body. Geophysical methods located Pima ore under 200 feet of alluvium. (From USBM IC 7822.)

4 EARLY STRIPPING of the Pima ore body. Approximately 200 feet of alluvium were stripped before ore was reached. Note MRS-Wooldridge units working around the original underground shaft sticking through alluvium.

upon the degree of sulfide mineralization. The spacing of drill holes, amounts, and types of powder used are different for all the above mentioned types of material.

Conglomerate rock is worked in two, 20-foot lifts. This is done to reduce the toe burden, and to avoid working under high banks of boulders. Holes are drilled on 10- to 12-foot centers, and three feet of subgrade drilling are required. Toe-holing is used in most instances. A high-strength, gelatin-based dynamite is used with a calculated powder factor of 1.2 to 1.6 pounds per cubic yard. Deck charging practices are employed, with the charge being placed in the more dense conglomerate layer as indicated in the bank face. Although fragmentation is fairly good, some secondary blasting is carried on to size the broken material for subsequent skip hoist handling.

Much wider hole spacing is used for the hanging wall rock, normal spacing being from 20 to 24 feet. Crest burden is 10 feet, toe burden is 24 feet, with at least three feet of sub-grade drilling for 40-foot banks. An ammonium nitrate blasting agent is used, with 20 percent dynamite used as a primer. Good fragmentation occurs, and powder factors range from 0.5 to 0.7 pound per cubic yard.

Hole spacing varies from 15 to 18 feet in the altered carbonate rock. Normal toe and crest burden is 10 and 25 feet, respectively, with increased subgrade drilling of five and six feet for 40-foot banks. Holes are loaded with ammonium nitrate and a dynamite primer.

Primary shots are all detonated with Primacord tied to the dynamite at the bottom of the hole. Black fuse and blasting caps set off the Primacord. Improved fragmentation and controlled backbreak can sometimes be achieved with the use of mulli-second Primacord connectors. Blockholing and mudcapping provide the means for secondary blasting, although the latter method is used only where drilling time is short.

Ore Handling

A fleet of seven, 16-cubic-yard, end dump Kenworth trucks are used to haul broken rock from the shovels to the skip loading pocket. The haulage units are powered by 300-horsepower turbo-charged, Cummins engines with Allison torquematic transmissions. Four additional 34-cubic-yard, end dump tractor-trailer units, powered with the same engine but having 10-speed Fuller transmissions, are used to transport ore from the skip hoist bins on the surface to the crusher and waste dump.

Ore and waste rock are loaded by means of three Bucyrus-Erie 54-B Diesel shovels. They are small (only 2½-cubic-yard capacity). The relatively small size was chosen for both mobility and sizing. Sizing is important for convenient handling by the skip hoisting system, as the skips will handle conveniently a boulder no larger than the size of the shovel bucket. Mobility is also important, as shovels have to be moved around quite frequently from areas of high-grade ore to areas of low-grade ore, or to waste. Thus small mobile shovels can economically provide the proper ore blend to keep mill heads at a predetermined level. Two shovels are scheduled on each of three shifts and one shovel is idle for maintenance on each shift. Average production per shovel shift is approximately 1,200 cubic yards.

Maintenance

Repair and maintenance on the hoist is done on Sundays. Pit equipment is serviced, maintained, and repaired by the mechanical department. Shop personnel, under the able direction of "Nick" Nicholson, mechanical superintendent, consist of 35 men including mechanics, welders, servicemen, machinists, and electricians, working on three shifts. Each unit of pit equipment is serviced every day. Thus availability of all major pit equipment is well over 90 percent.

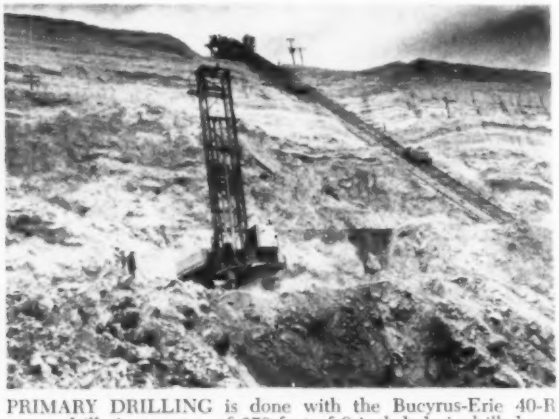
Safety

"At Pima, safety begins from the top down." This is a quote by Alex Monroe, Pima's safety engineer. It will give you some idea of the thorough safety program in force throughout the entire operation. The safety idea is effectively carried through to the operating level by a system of safety committees. Committees are made up of department heads and operating employees. One employee from each department comprises one of the safety committees, while department heads make up the other. Employees on the committee make a safety examination of the entire operation monthly, and report their findings to the department head committee in writing. These reports are discussed at the department head meetings and action is taken on applicable suggestions.

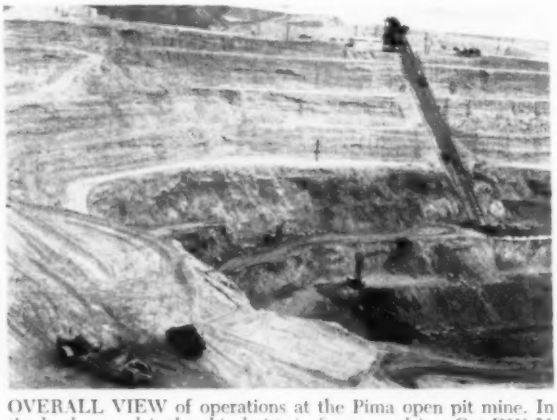
Safety meetings are held monthly by each department. At these meetings safety is taught by lecture, visual aid, demonstrations, etc. First aid training at the meetings is quite extensive, too. In addition, weekly examinations of the property are conducted by the safety engineer.

Such a comprehensive safety policy bears out Pima's statement that "Efficiency in production is directly proportional to a high safety record."

THE END



PRIMARY DRILLING is done with the Bucyrus-Erie 40-R rotary drill. An average of 350 feet of 9-inch hole is drilled per shift, using Hughes Tricone bit.



OVERALL VIEW of operations at the Pima open pit mine. In the background is the skip hoist, in foreground is a Cat DW-21 doing current stripping.

Why Skip Hoisting Pays at Pima's Deep Narrow Pit

Skip hoisting is fast, and economical, too. It is an efficient way of getting ore out of a relatively small, deep, open-pit mine.

The Pima skip hoist installation, manufactured by National Iron Works, is on the north and final slope of the pit, with the loading pocket just below the 3,070 bench, 280 feet below the headframe. Currently, ore and waste rock are being mined from four benches—two of them above the loading pocket and two below. Truck haulage brings the material to the loading pocket, where it is dumped into 22-ton skips, and is hoisted into 200-ton-capacity receiving bins, integrally built into the headframe.

Reduction in stripping requirements and operational costs were the decisive factors in the selection of a skip hoist over truck haulage.

Trucking the ore and waste out of the pit would mean the establishment of permanent haul roads at least 50 feet wide with a maximum grade of 8 percent. Also, in order to reach the lower limits of the pit, these roads would have required an additional 100 feet of stripping at the surface beyond those limits established to recover the ore. With this system now in use, temporary roads can be cut where needed to haul from one bench to another for skip access. Also, all that is required for service into the pit is a 12 percent road, 30 feet wide.

Careful studies of the two haulage methods showed that a skip hoist system would result in savings of over six cents per ton, even though the capital expense would be greater. Estimates showed that this additional capital could be amortized in slightly over seven months by the savings in operational costs.

A double set of 100-pound rails, having a 10-foot 2-inch gauge separated by a distance of 3 feet 6 inches, make up the skip hoist railway. Two surface bins are provided so that both ore and waste may be handled simultaneously. The bins are separated by hydraulically controlled flop gates, operated by the hoist man, so that loads may be directed into either hopper. Loads are discharged from the hoppers by hydraulically operated reciprocating plate feeders, capable of loading a 34-cubic-yard truck in about 90 seconds.

The hoist consists of two cylindrical drums coupled by an expanding toggle type clutch engaging an internally geared ring. Drum diameter is 8.2 feet, with a width of 7.8 feet, and grooved for 1⅞-inch rope. Power is supplied by four, 500-horsepower, 1,750-revolutions per minute, 4,160-volt, 3-phase, 60-cycle, wound rotor, Westinghouse induction motors.

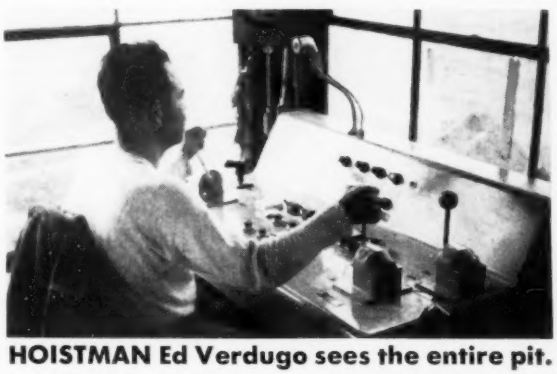
Built-in safety features afford protection from over speed, over travel, reverse travel, brake malfunction, and clutch not engaged. Each safety device is backed by a second mechanism in case the first one fails.

Complete control of the entire skip hoisting operation stems from the hoist operator located near the top of the headframe. From this vantage point, the entire operation is visible. Squawk box communication is provided between the hoistman, skip tender in the pit, receiving hopper feeder operator, and the hoist house.

Results obtained through use of this hoisting system are good. In an average month 6,000 cubic yards per day of waste rock or ore are handled by the hoist on a three-shift-per-day operation. Equivalent to 14,000 tons or about 700 skips.

SKIP DUMPS into bin below operator.

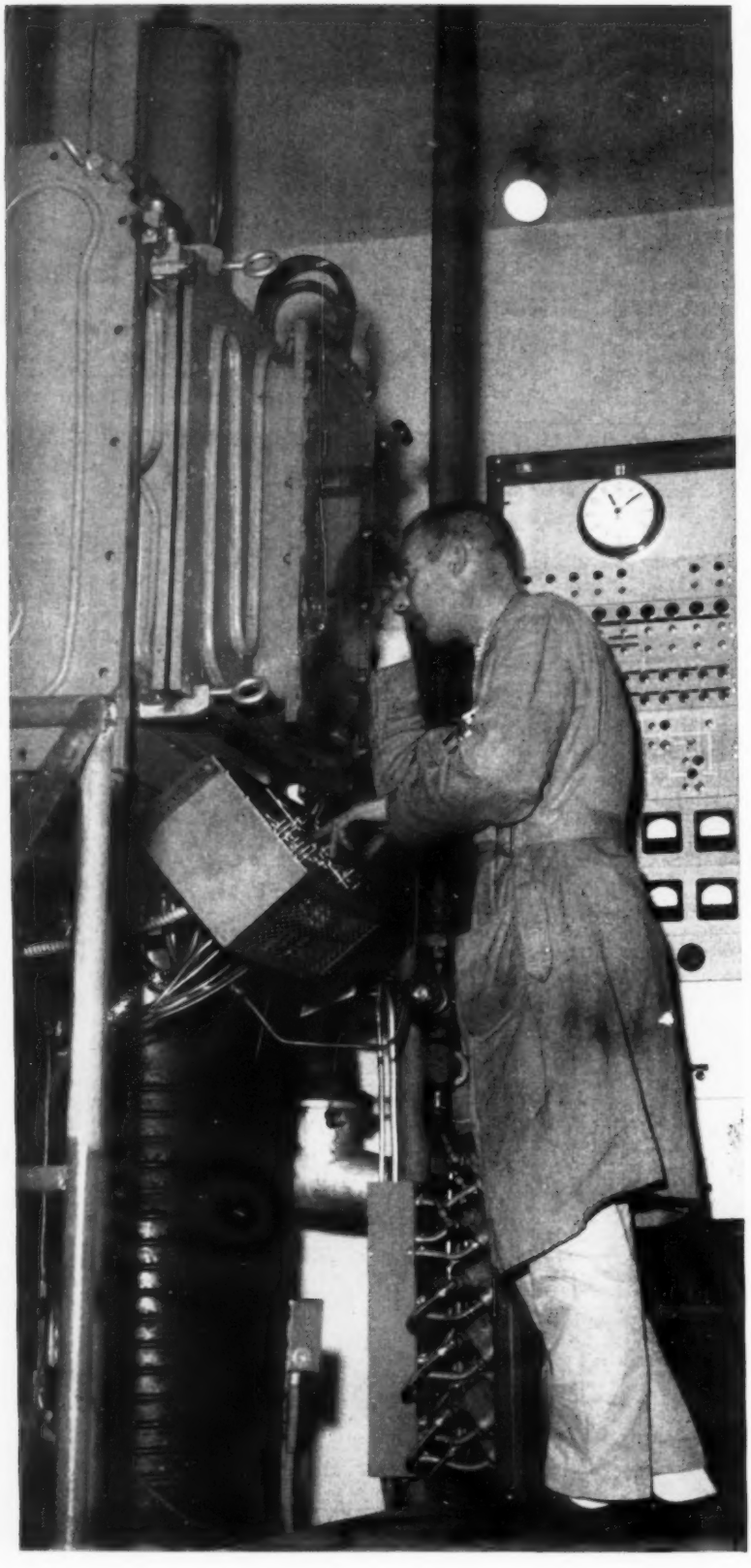
LOOKING DOWN from operator's booth.



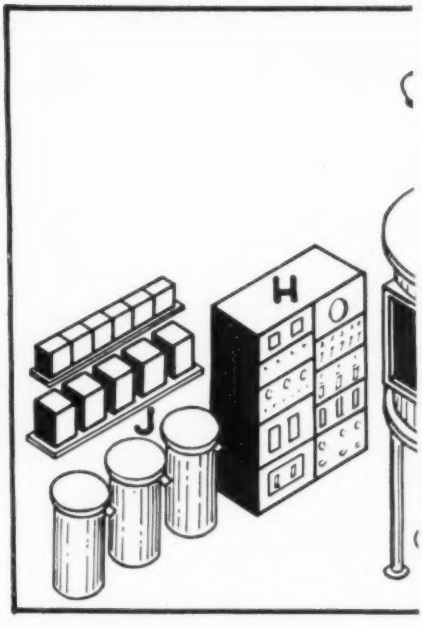
HOISTMAN Ed Verdugo sees the entire pit.

HEADFRAME, bins, operator's house on rim.

Electrons plus vacuum . . .



In this installation . . .



SCHEMATIC DIAGRAM shows various components of installation. C—Casting chamber; D—Diffusion pump; E—Chamber main valve; F—Jet pump; G—Mechan-

New Refining

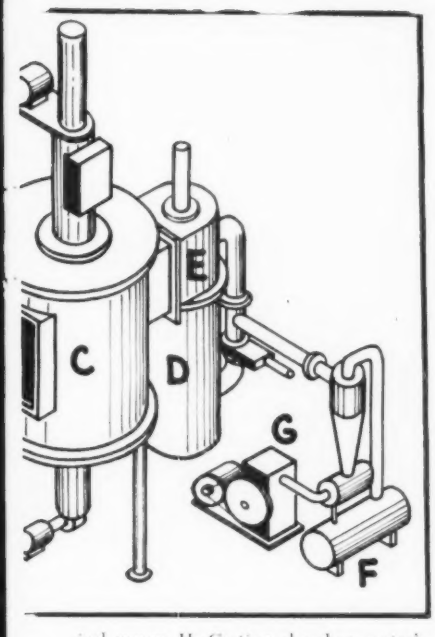
BY STANLEY H. DAYTON
Associate Editor

Electron beam melting of refractory metals under a high vacuum is exciting considerable interest in refining circles. The process, initially conceived by Temescal Metallurgical Corporation, Richmond, California, holds significant possibilities for de-gassing highly reactive metals. It is fast, appears economically feasible, permits recycling of scrap, and is capable of consistently yielding ultra-pure ingots. Joining Temescal in development of the method were Stauffer Chemical Company and Mallory Sharon Metals Corporation. The above three companies plan to license the process to interested industrial concerns and research groups.

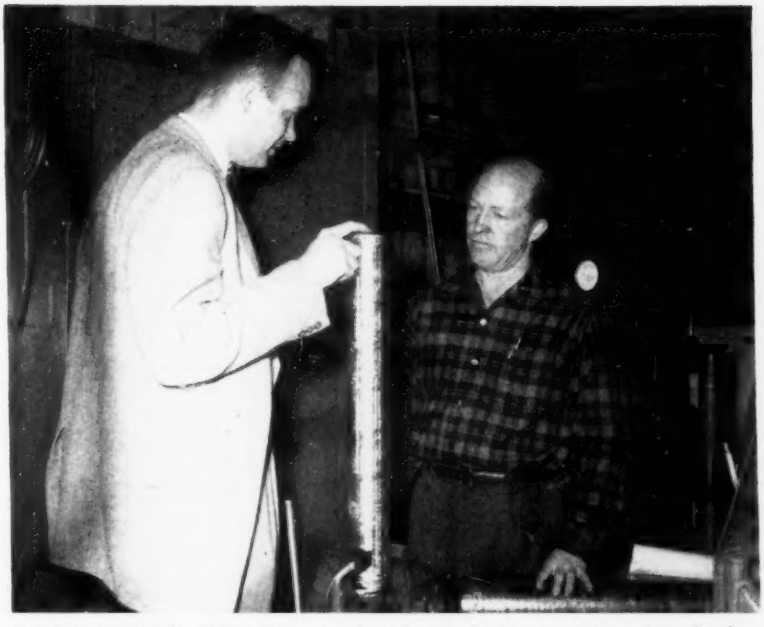
The process utilizes electron bombardment of impure metal stock in a furnace under a vacuum of 10^{-7} atmospheres. Electron bombardment melts the stock. Impurities are boiled from the melt if the vapor pressure of contaminating compounds exceeds

ELECTRON BOMBARDMENT of feed stock under a high vacuum boils out impurities. This unit melts stocks of Be and U.

Yield ultra-pure columbium . . .



ical pump; H—Casting chamber controls; I—High voltage power supply.



PURE COLUMBIUM INGOT is pointed out by Charles Hunt, manager of the development project undertaken by Stauffer Chemical, Mallory Sharon, and Temescal. Columbium produced by electron beam refining is amazingly ductile says Charles Hanks (right).

Process Purifies Refractory Metals

a pressure of about 10^{-5} atmospheres. The process has been proven on a semi-commercial scale. It may prove important in treatment of such metals as columbium, tantalum, beryllium, molybdenum, zirconium, vanadium, and titanium. It may also prove useful for tungsten. Electron beam melting looks like it may be a key step in columbium metallurgy.

It's still too early to evaluate the economic impact of this method of refining. Most attention, however, is riveted around three factors—the possibility of reducing processing costs; the extreme flexibility offered; and commercial-scale casting of virtually pure metal bars.

Several other advantages are claimed for electron beam melting. Unrefined stock can be fed to the furnace in almost any form, such as ingot, powder, flake, or sponge. Loss in milling and fabricating reactive metals can be reduced because scrap can be recycled to the furnace. This is a very important factor, considering the high cost and loss inherent in handling many chemically active materials. It is entirely conceivable that the process can be engineered to operate continuously and automatically.

Furnace Components

For purposes of description, the furnace contains the following components:

1. **An ingot feeding device** by which contaminated metal is introduced vertically through a vacuum lock at the top of the furnace;
2. **An electron gun** within the furnace. The electrons are emitted from a tungsten wire within the gun which serves as a cathode. The gun beams the electrons at the lower end of the unrefined metal stock which serves as the anode. A high negative potential exists in the field between the gun and the stock which greatly accelerates the electrons.
3. **A water-cooled, cylindrical, copper crucible,** open at the bottom. The opening connects with an ingot receiving chamber mounted vertically below the bottom of the furnace.
4. **An ingot pulling device** which gradually draws the solidified and purified ingot from the crucible into the receiving chamber as the melt freezes.
5. **Three sets of pumps** for maintaining a vacuum of the range of 0.1 to 0.01 microns in the melting atmosphere of the furnace.

The unrefined stock is fed at the top of the furnace. The beam of electrons focused at the lower end of the contaminated ingot heats the tip to the melting point. Molten metal drops into the water-cooled, copper crucible below the end of the feed stock. The heat required to keep the metal in the cold crucible in a molten condition is also supplied by electron bombardment. The surface of the molten pool is kept at a constant level as the purified ingot is drawn down through the receiving chamber.

As the metal melts, impurities are volatilized. Generally the primary impurities of the unrefined stock consist of carbon, oxygen, and nitrogen. The latter two are frequently troublesome because they cause metal embrittle-

ment. The above three elements are removed as carbon monoxide, metal monoxide, metal nitride, or nitrogen. Anything will be volatilized which has a vapor pressure greater than about 10^{-5} atmospheres.

Technical Factors

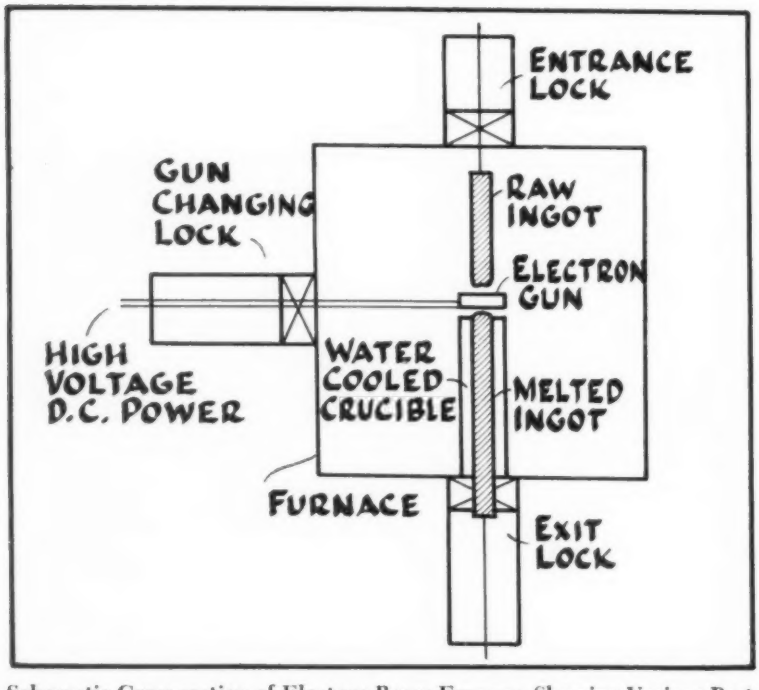
The two major principles of operation—electron bombardment and vacuum metallurgy—involve familiar concepts in metal treatment. Many reactive metals have been purified through the application of vacuum metallurgy. Similarly, researchers have used electron bombardment on a very small scale as a source of heat for melting metals in the past. Two major obstacles, however, were mastered by the Temescal-Stauffer-Mallory Sharon group in combining the two principles. First was the stabilization of the electron beam on a large scale. The second obstacle includes the techniques of obtaining and maintaining the high vacuum in the furnace.

Still another important technical point is the ability to hold the metal in a liquid form in the cold crucible without the addition of any material. A cold crucible virtually eliminates the possibility of contaminating the molten metal by the material from the crucible walls. The new refining process developed by the joint venture group is the first time that electron bombardment and vacuum metallurgy have been combined with cold crucible operation.

The temperature attained by electron bombardment is largely a theoretical consideration. There is no upper limit except the ceiling imposed by boiling or decomposition of the stock. The total energy available is a function of the speed of the electrons which are accelerated through the electric field. This represents the amount potentially convertible to heat.

What About Cost?

The economics of electron bombardment look favorable at the present stage of development because high voltage, d-c electrons are relatively cheap and power efficiencies are high. The power input to the electron gun, though variable depending on the metal and amount of impurities in the metal, is considerably less than that required for vacuum sintering and somewhat less than that required for vacuum arc melting. A double melt to obtain a highly pure ingot of columbium requires three to four kilowatt hours per pound of metal. The power requirement for tantalum is about six to eight kilowatt hours per pound. By way of contrast, tantalum requires 300 to 500 kilowatt hours in refining by present vacuum sintering in the solid state.



Schematic Cross-section of Electron Beam Furnace, Showing Various Parts

Semi-scale production models of the electron beam furnace have been built. One is a 3-inch (refined stock is three inches in diameter), 120-kilowatt furnace. A newer model was recently completed for production work on bryllium and uranium. It is a 3-inch, 60-kilowatt furnace. The second furnace has all the capacity offered by the first; but it was found that a 120-kilowatt system was not required to develop the heat necessary for melting stocks of beryllium and uranium. The second furnace mentioned has all the features of the first. In addition it contains an improved system of vacuum locks on the ingot feed and ingot receiving chambers. It also contains an ingot cooling chamber which should increase the available operating time.

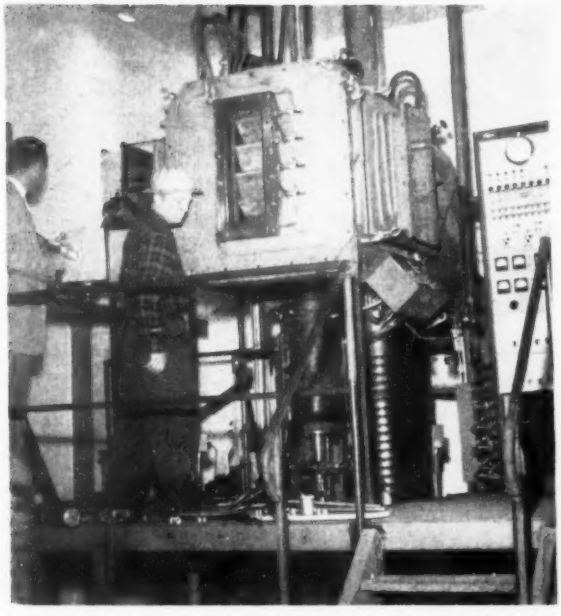
Refining Rates

The refining rate is dependent on the percentage of gaseous impurities in the raw material ingot. Usually two melts are required to produce an ultra-pure ingot. When working with columbium, the 3-inch, 120-kilowatt furnace attained a rate of 10 to 15 pounds of purified ingot per hour on the first melt. Remelts were carried out at rates of 80 pounds per hour, when this furnace was operated at 90 kilowatts. This corresponds to four feet of 3-inch ingot per hour and was based on actual refining of a 42-inch-long ingot of columbium.

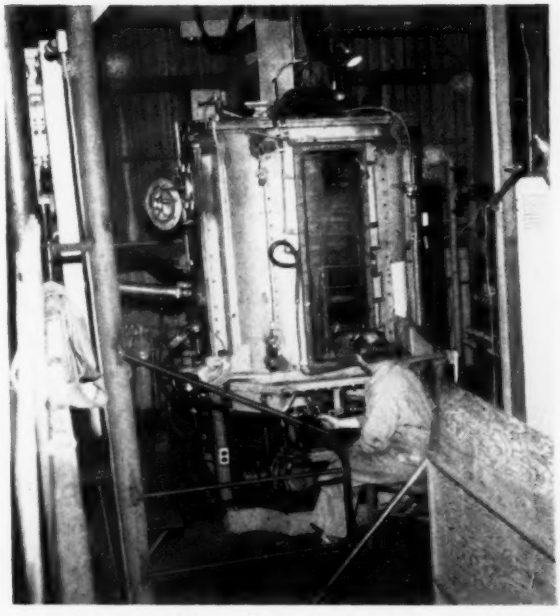
A great deal of the work with high melting point metals has been done with vacuum arc melting. The electron beam furnace of Temescal operates at a vacuum which is of the order of 1/1,000 of the vacuum pulled on an ordinary arc furnace. This means that purification rates are much greater in the electron beam furnace. The electron beam unit is equipped with a set of three vacuum pumps. The first is an ordinary vacuum pump; the second is a jet pump; and the third is a diffusion pump. The vacuum system of the 3-inch, 120-kilowatt furnace built by the joint venture group was rated at 16,000 liters of air-per-second at a pressure of 10^{-4} millimeters of mercury. The 3-inch, 60-kilowatt furnace has a vacuum system rated at 7,000 liters-per-second at the same pressure.

Process Is Continuous

At the present stage of development, metal refining is a continuous process from start to finish of the feed stock. A certain cooling period in the receiving chamber is required before the vacuum is broken. This is necessary to avoid contaminating the hot,



LATEST MODEL completed has automatic ingot feeding and pulling devices plus an ingot cooling chamber. Refining rates are dependent on percentage of gaseous impurities.



SEMI-WORKS MODEL shown above melts 3-inch diameter stock. Power requirement during trial runs on tantalum was 2% of the requirement for purifying by solid state sintering.

purified ingot with gaseous impurities of the atmosphere. On-time during regular production runs has amounted to about 35 percent when the ingot is cooled in the receiving chamber. The newer furnace completed contains a separate chamber for cooling. It is offset from the receiving chamber and connected with the latter by a vacuum lock. The cooling chamber will be under a helium atmosphere. It is estimated that this new furnace will realize 60 percent on-time.

Suitable automatic controls for the electron beam furnace are being investigated. This would eliminate some of the operator time necessary to monitor and control the process. Melting and drawing rates are governed by the melt level in the crucible. One proposed system is to use mirrors to reflect the pool level to a suitable TV monitor. The TV monitor, in turn, would be interlocked with the ingot pulling device.

Electron beam melting will compete with but will not replace vacuum arc melting which has been more widely used for treating some of the special metals. The two processes differ in principle. Vacuum arc melting makes use of a low-voltage electric arc as contrasted to the high-voltage electron bombardment of the unit designed by the joint venture group. The greater vacuum of the electron beam furnaces has already been mentioned. Each, however, will have its special area of application.

Other Advantages

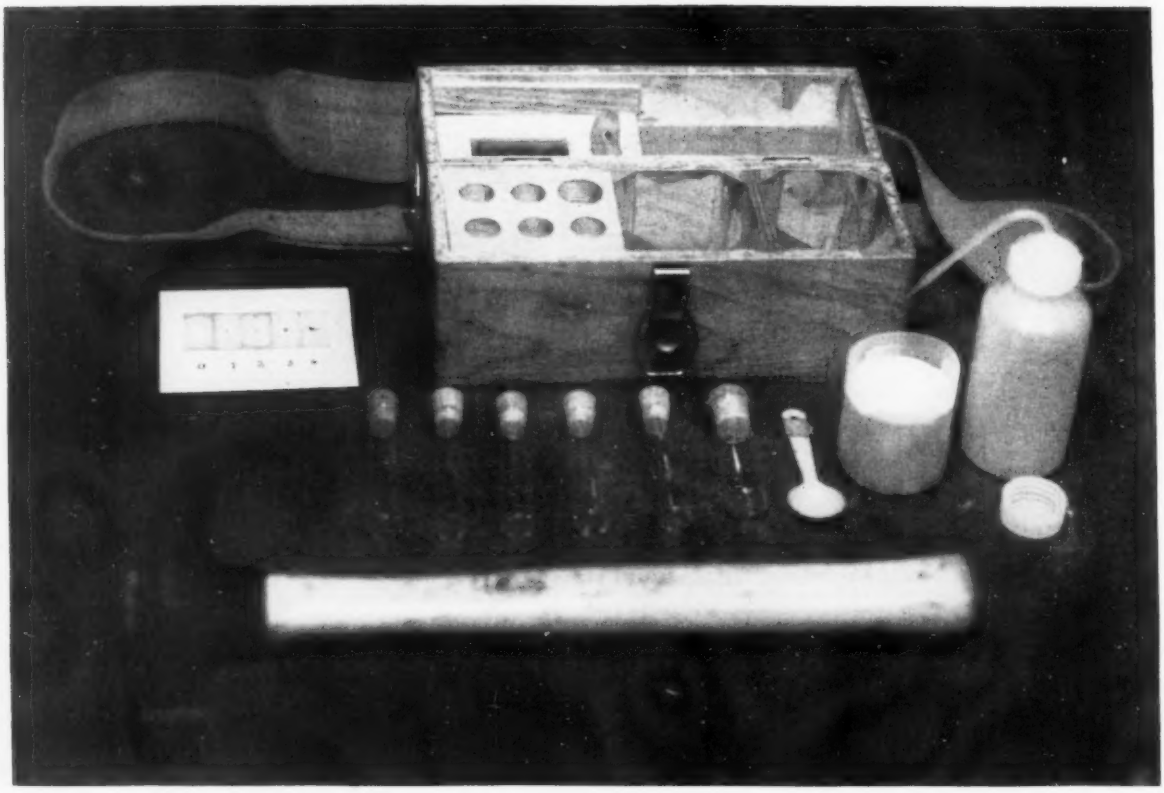
The electron beam process can be stopped and started at will. Vacuum arc melting can not be stopped once it is started because a valuable ingot is often lost if it becomes necessary to halt the process. Temescal reports that it only requires about 15 minutes to charge the feed stock and pull the required vacuum on the electron beam furnaces. It was pointed out earlier that electron beam melting can handle feed material in any form. The arc process requires a compacted feed stock.

Electron beam melting is limited to metals which evaporate slowly under the temperature-pressure conditions prevailing at the surface of the melt. Chromium could not be refined by electron beam melting because it is too volatile. The very factors that make electron beam melting such a valuable tool for refining some metals, renders it completely useless for casting certain alloys. This condition arises because of possible differences in the vapor pressure of the alloy constituents. An alloy ingredient which possesses a much higher vapor pressure than other additives in the stock vaporizes more readily. The net result would be a change in alloy composition.

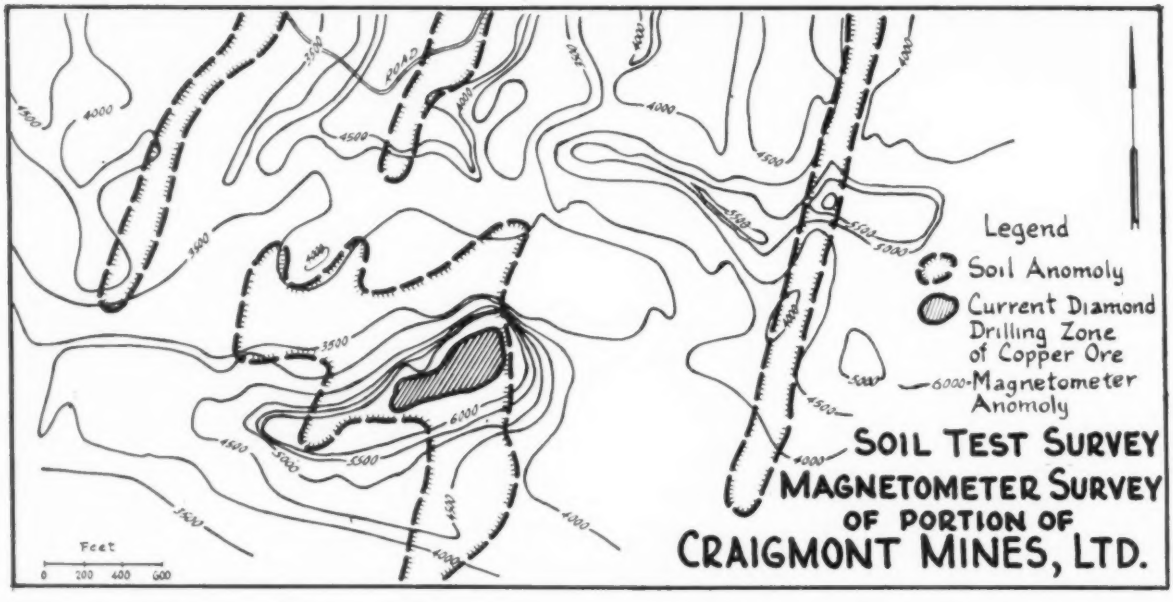
Electron beam melting can also be used for zone refining. In some respects it may prove superior to present zone refining methods. A big advantage of electron beam melting is that there is no apparent limitation on the diameter of the bar or ingot that can be processed. This is a definite limitation of conventional zone refining methods for highly reactive metals.

Those who were instrumental in developing the electron beam process have high hopes for the future. They plan to license the process to interested firms and to push commercial application of electron beam melting. They visualize their new development as representing a fundamental step in treating columbium which could lower the cost to a level more attractive for developments of markets. Some of the results with electron beam refined columbium have been simply amazing. One industrial customer reportedly made 0.5 mil columbium foil from a 3-inch ingot by cold rolling without annealing. Ductile columbium previously was little more than a laboratory curiosity made by solid state sintering. It may now be a commercial reality. THE END

This Soil Sampling Kit . . .



Found This Copper Anomaly . . .



Pointing To Craigmont Ore Body

By R. E. RENSHAW
and
FRANKLIN PRICE

From prospect to potential major copper and iron mine is the successful story of Craigmont Mines Limited, holding 154 claims at the southern end of British Columbia's Highland Valley.

The prospecting stage ended in May 1957 when the No. 3 surface diamond drill hole "Discovery Hole" on the Merrell anomaly had a continuous ore grade section 337 feet long averaging 0.96 percent copper and about 30 percent non-sulphide iron (magnetite, hematite). The deposit began to look as though it could support a major open-pit operation in September when the then sensational No. 7 hole drilled to a depth of 770 feet averaged 1.91 percent copper and 37 percent iron for 645 feet. Some 17 holes have now been completed and No. 15 in the heart of the anomaly showed 500 feet of solid ore grade mineralization—4.188 percent copper—to a depth of 670 feet. From 170 to 830 feet, the hole averaged 4.31 percent copper.

How To Use Field Kit For Copper Soil Tests

Dig out soil just underneath vegetal liter with trowel; measure about one gram with scoop, and place in small test tube. Add strong acetic acid solution from Nalgene jet bottle. Shake mixture well and pour into filter held in polyethylene beaker on top of reagent paper (rubianic acid).

Standard spot test results are shown on card opposite:

0. Negative, usual background.
1. Rich agricultural soil or mild copper anomaly.
2. 3. Copper anomaly.
4. Very large soluble copper content.

Field kit is made by D. Rimbeaux, 941 East 41st Avenue, Vancouver, British Columbia.

In late 1954 Craigmont was incorporated to acquire and develop an eight-claim copper prospect. First work was surface bulldozing. Other claims were staked or acquired until today the property of Craigmont Mines consists of 154 mining claims and/or fractions containing 7,500 acres, more or less. They are located 12 to 14 miles northwest of the City of Merritt, in the Nicola Mining Division, British Columbia, Canada. More popularly, this region has been called the Highland Valley district.

Mr. Renshaw, a geological engineer, and Mr. Price, a mining engineer, are exploration engineers for Craigmont Mines. Mr. Renshaw has headquarters at Vancouver, B. C. and Mr. Price at 1105 Northern Life Tower, Seattle, Washington.

Geology

Rock exposures are very few on the property. Almost 90 percent of the bedrock is masked by grass range land, small stands of fir and pine, and by a thin but persistent layer of glacial debris.

The northern half of the property is underlain by granodiorite and kindred rocks of the Guichon batholith of Jura-Cretaceous or Tertiary age. The rocks in the southern section of the claims consist of lavas, tuffs, and limestone of the Nicola series of Triassic age. These are overlain in part by a narrow belt of lavas, tuff, arkose, and conglomerate of the Kingsvale group of Lower Cretaceous age.

Copper minerals consisting of chalcopyrite, bornite, chalcocite, and secondary copper carbonatees occur in the lavas and granodiorite in the form of veins, in shear and breccia zones, and as disseminations.

In 1956 Craigmont controlled a large area. The big question was where to diamond drill to find an ore body. While the general geology of the area was known, the lack of rock exposures as outlined above necessitated a diamond drill exploration program. But where to drill was the big question. Here are the problems that faced the writers in selecting areas to be drilled:

1. **The property consisted of 7,500 acres.**
2. **Over 90 percent of the claims were covered with overburden.**
3. **Interesting copper mineralization was found in seven small and apparently unrelated outcrops.**
4. **Time was important and a decision had to be made about which outcrop should be drilled first.**

Soil Testing First

After due consideration, it was decided that a soil testing survey, followed by a magnetometer survey, would be the best means of proving a favorable area as quickly as possible. The magnetometer has been used for many years and engineers have long appreciated its value in exploration of mineral deposits. Soil sampling, however, was a relatively new approach. After considerable research and several consultations with Dr. H. Warren and Dr. R. Delavault, Professors of Geology at the University of British Columbia, the method decided to be the easiest and most suitable was the rubianic acid technique perfected by them at the U.B.C.

PLACE-FIX map of Craigmont's discovery in southern British Columbia.

Soil sampling in the field is carried out with a crew of three men—two men to cut picket lines and take the sample, and one man at the office to run the tests. Depending on the area and the distance to be travelled, 30 to 40 samples a day may be taken and tested.

The Craigmont examination was made by using a transit control base line extending through the center of the area. From this base, Brunton control lines were cut at right angles to the transit line every 300 feet. Samples of soil were then taken every 100 feet along these lines. These same stations were later used for the magnetometer readings.

In soil testing work it has been found that the same horizon must be tested in any given area, as the tests are relative. The soil may be sand, gravel, clay, very recent alluvial, or loam, but regardless of its nature it should be taken from the same horizon over the test area. In the Craigmont test we selected the nearly top surface lying just below the grass roots about three inches below the surface. The size of each sample was about one ounce. This was put into a small plastic bag and tagged with its location.

It takes only five minutes to run each soil sample in the office and the results are quickly obtained on the prepared rubianic acid test paper. A positive copper test is shown by a black stain. The size of the stain and

CUTTING SOIL SAMPLE at Craigmont. Mining engineer, F. L. C. Price, positions this sample to confirm with magnetometer station grid pattern. No rock crops out in area.

READING MAGNETOMETER over soil sample cut is R. E. Renshaw, geological engineer. This picture shows wooded area and grassy slopes typical of the surface cover which masked bedrock at Craigmont.

its intensity is a direct indication of the amount of copper in the soil.

How Samples Analyzed

Since the tests are relative, we made a standard after running several samples and blanks. Four degrees or sizes of the black positive stain were established, ranging from nil to excellent. As the tests were completed they were immediately plotted on the map as one of the four degrees, i.e. nil, trace, good, or excellent.

A brief outline of the technique follows:—

1. **All beakers, test tubes, etc. are thoroughly washed and rinsed in distilled or demineralized water.**
2. **A one-cubic-centimeter sample of soil (a thimble makes a good measure) is treated in 2 cubic centimeters of 25 percent sodium acetate to which enough acetic acid has been added for the solution to have a pH of 4.0. This is put in a 5-cubic-centimeter test tube and shaken for a minute.**
3. **A strip of rubianic acid reaction paper is put in the bottom of a 25-cubic-centimeter beaker. A filter paper is folded and placed so that its tip is in contact with the reaction paper.**
4. **The soil-acetate solution is filtered, and the reaction paper dried and filed for future reference and plotting.**

Plot Results On Map

As the work proceeded, the map took shape and it was seen that the anomalies of copper concentration were all long and narrow, parallel to the regional structure of the area, except one that was much wider. See accompanying map. The completed soil sampling map outlined four anomalies, each about 200 feet wide except for the Merrell claim where the width was 1,200 feet.

DIG BELOW surface vegetation to take soil sample. However, great care must be exercised in taking each sample at same depth from surface.

A magnetometer survey was later made over the area, using the same stations from which soil samples were obtained. The resulting magnetometer map confirmed the soil anomalies and they were almost identical in shape.

A diamond drilling program was started on the area of the largest soil anomaly and highest magnetic contours. The results from this drilling were more than gratifying. In a report issued by E. P. Chapman, Jr. of the consulting firm of Chapman, Wood and Griswold, Albuquerque, New Mexico, October, 1957, he states "Diamond drilling at the Craigmont Mines Limited ore body at Merritt, B.C. indicates the presence of 14,490,000 tons of ore containing an average of 1.21 percent copper, as chalcopyrite, and commercially interesting quantities of iron."

Since October 1957, diamond drilling has continued, and an ore body of 20,000,000 tons of 2.0 percent copper and 25 percent iron has been indicated.

As an indication of the merits of soil testing, diamond drill hole No. 15 put down in the heart of the anomaly disclosed 500 feet of ore from a depth of 170 feet to 670 feet which assayed 4.188 percent copper.

From these results we can see that geochemical methods are a new tool for the engineer and prospector in locating copper deposits in an overburden covered area.

THE END

MINING HIGH-GRADE uranium ore. The face being drilled assays well over 20 percent U_3O_8. Note band of dark, average grade, ore behind miner, Pete Schmidt, and between lighter colored low-grade ore. Back is waste. The breast of stope and pillar at left are high grade. Note the hard black brilliant character of the solid ore in the pillar.

Big Indian's Biggest Bonanza

At Ike Mine 34 Men Are Now Mining 13,000 Tons of Ore Which Should Have $2,500,000 Gross Value

When Lisbon Uranium Corporation, on April 10th, shipped the one and only 20 tons of plus-20-percent uranium oxide ore to qualify for the U. S. Atomic Energy Commission's Circular No. 2 $10,000 bonus, many people believed that it was a carefully sorted, long-time accumulation of high grade.

This belief is only partially true in that the ore was a selected high-grade lense within the north ore body at the Ike mine in Utah's Big Indian district. However, the ore was drilled, blasted, slushed, trammed, and hoisted in the same manner as every other ton of ore mined at the Ike.

Even more remarkable is the production of 5,690 tons of ore in May with an estimated grade of 2.0 percent U_3O_8. The company is scheduled to mine 7,000 tons of ore, of similar grade, in June with the expected gross value of May plus June production as $2,500,000.

However, this is not the annual projected or planned rate of production from the Ike. Mining schedules, the ore buying contract with the Uranium Reduction Company's Moab mill, and other factors determine the actual mining rate.

Thus, the Ike is big news in the mining world, when a total crew of only 34 men working five days a week for two months can mine $2,500,000 worth of ore. Of this crew there are normally 25 underground, the others being seven surface employees, one foreman, and one superintendent.

It's difficult—in fact, almost impossible—for the iron miner and the base metal miners, too, to consider just how high grade this uranium ore is. The bonus winning 22.25-ton shipment isn't the highest grade ore ever mined, because at least one early-day gold shipment from Goldfield, Nevada's Hayes-Monette Lease shipped to the

THE PAY OFF. A. P. Kibbe, center, president of Lisbon Uranium Corporation, receives Bonus check from Allan E. Jones, right, manager of the Grand Junction Operations Office of the AEC. M. N. Gaines, left, sampled ore for Lucius Pitkin, Inc., AEC buyer.

Selby, California smelter on February 9, 1907 settled for $574,958.39 for 47.0 dry tons of gold ore.

Remarkable Production Goal

Nevertheless, the goal at the Ike shaft is remarkable in all mining history for both the large tonnage and the fact that it is mine-run ore, mined during the normal course of production in high-grade sections of the mine. The ore is not sorted, cobbed, or hand picked; in fact it isn't even popped onto canvas in the customary manner long used for high-grade ore. Don't be misled by mining practice as the Ike uranium ore is worth money, heavy money, too. The bonus ore, 22.92 percent U_3O_8, was worth $2,295 per ton under AEC Circular No. 5, the bonus $447.00 per ton for a total of $2,742 per ton or $1.37 per pound of crude ore. Even the lower grade uranium ore at the Ike is valuable: The 1.0 percent U_3O_8 ore is sold for $94.50 per dry ton; 2.0, $194.50; 3.0, $294.50; 4.0, $394.50; and 5.0, $494.50.

While normal mining methods were used underground for producing the high grade, the company insists that extra precautions be taken on the surface to prevent loss or contamination. The one-ton skips dump directly into a steel bin set in the head frame. Ore is loaded into trucks from the bin and the truck beds are immediately covered with canvas. At the Uranium Reduction Company mill at Moab which receives and samples ore, every truck load is dumped onto the concrete sampling pad before crushing. This is a different practice than at several other Big Indian mines where ore is stockpiled on surface, by grades, adjacent to the shaft, haulage is in uncovered trucks, and lots are dumped on the sand at the mill. Of course, the bonus winning lot was trucked directly to AEC's Grand Junction office.

How Ike Mine Developed

The Ike shaft was sunk by Lisbon Uranium Corporation to develop ore on the Ike, Nixon, Nixon Fraction, Nixon No. 2, Dixie Fraction, Shine, Nixon No. 2 Fraction, and Republic mining claims discovered by surface diamond drilling. Lisbon's parent company—Atlas Corporation—had purchased the claims from Charles Steen and associates; in fact, the Ike is the first known high-grade ore body north of Steen's Mi Vida mine.

The two-compartment shaft was collared in July 1956 and completed to a depth of 586 feet on January 22, 1957. First ore was produced in March when 391 tons of 1.93 percent U_3O_8 ore were mined and shipped. In the next six months, 17,847 tons of 0.70 percent ore were mined. In November 1957 a long drift to the north reached the high-grade ore in what is called the North Ore Body.

By February company management knew that it would be possible to mine a bonus winning ore shipment and the first portion was carefully mined. The termination date for the bonus was temporarily forgotten and it was only about 10 days before final date that mining of the high grade started. It was drill, blast, slush until shipment had been completed. It would have been very easy to produce several similar lots from the high-grade sec-

EVERY POUND of ore is recovered at the Ike mine. The back is then allowed to cave as pillars are pulled and retreat takes place to the left in this picture. See how blocky and slabby the hanging wall is when it caves.

THEY MINED the ore, Lynn Berry, left, Ike mine foreman, and Henry Shefelbine, Lisbon's district supervisor.

tion shown in one of the pictures.

Why High Grade Localized

W. B. Loring, geologist for Lisbon Uranium, has made an intensive study of the Big Indian district and believes that localization of this grade ore in the North Ore Body has been due to two things. First, a northeast fracture which shows on surface (not found underground to date) afforded a mineralizing solution channel, and second the basal Chinle ore-bearing horizon in what is now North Ore Body had a series of entrapped oil residues which acted as precipitants to concentrate locally high-grade uranium mineralization. The plus-20-percent concentration was only a few 10s of feet in area and up to four feet thick.

Develop For Slusher Mining

Lisbon's mining plan, based on a limited number of surface drill holes, is to drive strike drifts where possible along the lower limits of the ore bodies. These drifts, when in ore, are driven so that the bottom of the ore bed is in the upper part of the drift. This permits direct slushing on footwall into cars in the drift. The second step is to drive main scram raises, actually 6 to 9° flat inclines, updip in the ore at right angles to haulage drifts. The back is roof bolted where needed. Usually two rows of pierced plank landing mats are bolted to the back parallel to the line of drive. The third step is to drive a series of eight-foot-wide panel drifts off the scrams at right angles. These panels are driven to the limit of the ore. Each panel is separated from the next by an eight-foot-wide pillar. Both panels and pillars are staggered on opposite sides of the scram so that a pillar checkerboard is established. The final step is to pull the pillars retreating to the main drift. Pillars are drilled at a 35 to 40° angle to the panels with the holes pointed away from the ore limit. When ore is blasted, it is then thrown toward main workings—not into cave.

An important point to remember about mining cycle is that an active long hole prospecting program is carried on ahead, above, and below every stope face that has turned to waste. These holes are all probed for radioactivity. This drilling and probing of fringe areas has paid off as over 30,000 tons of ore have been found in Hidden Splendor Mining Company's and Lisbon's Big Indian mines by this long hole prospecting.

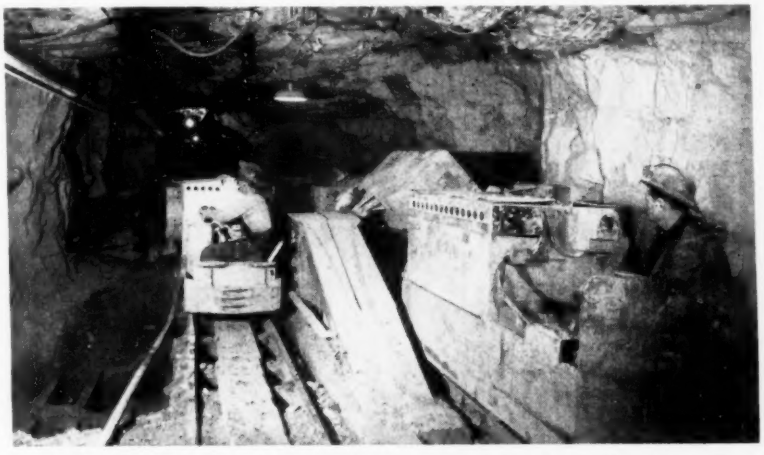
Panel Slusher Mining

This mining method necessitates slushing of about 90 percent of all ore as well as all stope rounds, are drilled twice in the stopes. Vulcan-Denver and Joy, double-drum, 20- and 25-horsepower, electric hoists pulling 48-inch Pacific and Cate slushers are used.

Ore is slushed directly into 2-ton Granby Coeur d'Alene Hardware cars from scram raises. Atlas 2½-ton storage battery locomotives haul the cars to the shaft where ore is dumped into a skip pocket. Development headings, with AirLegs.

A. P. Kibbe is president of Lisbon Uranium with headquarters in Salt Lake City, Utah. Dale I. Hayes, vice president and general manager of Hidden Splendor Mining Company, also supervises Lisbon's mining operations. Henry Shefelbine is district supervisor for the Ike and other Big Indian mines of Lisbon. Ike mine foreman is Lynn Berry.

THE END



DUMPING ORE into skip pockets at the Ike shaft 450-foot level. This picture shows how surplus World War II pierced plank landing mats are used for back support. Mats are rock bolted to back; parallel to the line of draft.

BONUS WINNING MINE RUN high-grade ore is loaded at the Ike shaft for shipment to the U. S. Atomic Energy Commission at Grand Junction, Colorado. Every pound of ore in this truck is worth $1.37. The truck load is worth $61,016.72.

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- From leveling stripping waste at the dump to pushing a scraper or cleaning up around the shovel down in the pit, the Performer's combination of 4-wheel drive and center-point steering, maneuverability, and power at the draw bar, keeps your operation under full control.
- The Performer's low center of gravity is a big safety factor in an operation of this kind. It rides easily over rough and torn up terrain.
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PIMA Copper Mine Operation

Located 20 miles southwest of Tucson, Arizona, in the desert wilderness, this pit mining operation gouges into the earth through 200 feet of alluvial overburden and 50 feet of rock to reach the ore-bearing stratum. The Westfall Performer works the entire area of the diggings, on the move from the stripping waste dump on the surface to the scraping operation on the bottom, traveling rapidly up and down the bench-to-bench grades to be quickly available for operation wherever most needed.

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Money Making Methods

Corrosion-Proof Light Weight Plastic Pipe Used for Mine Ventilation Lines

Glass-fiber, reinforced-plastic piping has been used very successfully for low-pressure, high-volume ventilation lines at the Swedish iron ore mine—Luossavaara-Kiirunavaara Aktiebolag. The new pipe has only one-fifth the weight of regular pipe; has a smooth lining to minimize air turbulence; and has a high chemical resistance to sulphuric, nitric, and hydrochloric acids. It is soluble, however, in acetone but that should be of no importance to a mine operator.

The pipe is made from glass strands that first are arranged in a special process to form a sheath around a mold and then are impregnated with liquid polyester resin. The pipe sections then are cured. The glass fiber strands employed as plastic reinforcements impart excellent stability and tensile strength to the pipe. Through its elasticity, the surrounding plastic medium offers an effective protection against compressive and flexural stress.

There are two standard sizes: 9.85- and 11.8-inch-diameter in 15.4-foot lengths. The smaller weighs 1.15 pounds per foot, and the larger 13.5.

Figure 1

Figure 2

Figure 4

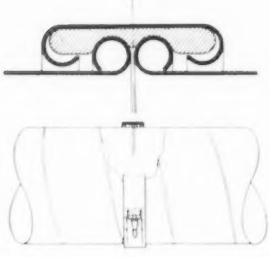


Figure 3

Figure 5

The pipe is delivered in standard lengths with a projecting bead at each end to match the snap joint (Figure 1). The rubber connection ensures perfectly tight joints and is easy to fit. For the large diameter two metal straps are fixed around the rubber connection to prevent it from slipping over the beads. With this rubber coupling, flexibility will be 4 to 5°.

When necessary, the pipe sections may be cut off by an ordinary saw. A broad foam rubber coupling (Figure 2) ensures tight joints even with rough pipe edges.

The Schwelm coupling (Figure 3) is another type that may be employed instead of the rubber coupling. Flexibility will be only 1 to 2°.

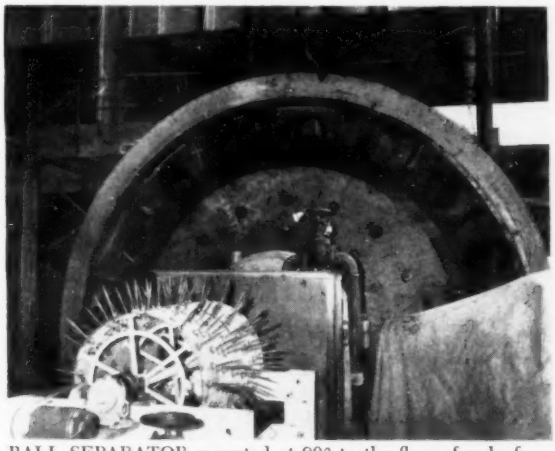
Standard elbows are delivered with 22.5°, 30°, and 45° bend (Figures 4 and 5) and with projecting beads for the snap coupling. Further, minor bends may be produced by forcible bending of joints and will not impair the tightness of the system. A 90° elbow is readily made by joining two 45° elbows by one of the standard couplings.

Nchanga Removes Broken Grinding Balls From Pulp Ahead of Cyclones

Mill operators have long been troubled by broken balls, steel scrap, etc. in the ball mill discharge getting into a pump. With the increased use of cyclones for classification, this trouble has grown because most mills pump overflow pulp to cyclones. Tramp steel, of course, can damage the cyclone lining or block the discharge spigot.

Nchanga Consolidated Copper Mines, Limited, Chingola, Northern Rhodesia is using a novel magnetic separator to remove this iron. The separator was designed by Allenwest (S. A.) (Pty.) Limited.

The separator comprises a non-magnetic drum fitted with steel spikes, similar in appearance to a spiked garden roller, and two electro-magnets supplied with direct current power from a rectifier. The drum is fitted above a pulp launder having a curved bottom, concentric with the drum shaft, with a small clearance between the points of the spikes and the bottom of the launder. The launder is made of non-magnetic material, and the drum revolves at 90° to the flow of the pulp. The two electromagnets are mounted beneath the launder, immediately below the drum, and supply induced magnetism to the pointed spikes which are immersed in the pulp stream.



BALL SEPARATOR mounted at 90° to the flow of pulp from ball mill picks up steel and carries it over edge of launder.

The iron is pulled up the side of the launder out of the pulp and released to fall outside the launder as the spikes pass out of the magnetic field.

Wear on the spikes has been heavy but the separator does a good job.

[In the United States a "ball trap" similar to a jig has been successfully used to remove iron from ball mill discharge. Ed.]

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United States

Personalities in the News——

TRAVIS P. LANE has accepted a position with the Arizona Department of Mineral Resources as a field engineer. He has been assigned to the northern district and will make his headquarters in Phoenix. Mr. Lane has had extensive experience in Alaska, Canada, and several western states. For the past three years he had been employed with the United States Atomic Energy Commission in Grand Junction, Colorado. Mr. Lane served two years as staff engineer in the mining division and more recently as metallurgical engineer in the processing division.

Dan R. Stewart has been promoted to the position of district manager of American Zinc, Lead & Smelting Company's operations in Missouri, Kansas, and Oklahoma. Since joining American Zinc's staff in 1944, Mr. Stewart has served as district geologist, western geologist, and acting district manager. Company headquarters are in St. Louis, Missouri.

Merlyn Woodle, former superintendent of Minnesota Mines with Republic Steel Corporation, has accepted a position with Reserve Mining Company as assistant manager of the Babbitt Mining Division, Babbitt, Minnesota.

James Windross was recently elected to the newly created office of vice president in charge of operations with the Fairmont Aluminium, a wholly owned subsidiary of Cerro de Pasco Corporation. Mr. Windross was previously employed by Phoenix Manufacturing Company.

Frank Wenneis has been promoted to assistant general manager of United States Potash Company, Division of United States Borax and Chemical Corporation, at Carlsbad, New Mexico. Mr. Wenneis, who joined the company in 1939, served as assistant to the general manager for the past year.

Walter A. Sterling has been elected chairman of the board for Cleveland-Cliffs Iron Company, Cleveland, Ohio, succeeding Alexander C. Brown who retired after 24 years of service with the company. Mr. Sterling is also president of the company.

Alvin C. Vaughn has joined the staff of Kennecott Copper Corporation as an engineer trainee at the Ray Mines Division, Ray, Arizona. Mr. Vaughn received his B. S. degree in mechanical engineering from the University of Arizona last January.

Phillip F. Allen will succeed **H. K. Martin** as superintendent of the Lavender Pit concentrator, Copper Queen Branch, Phelps Dodge Corporation, at Bisbee, Arizona. Mr. Martin has accepted a position with Oglebay Norton Company in Cleveland, Ohio. Prior to the transfer, Mr. Allen had been employed as metallurgist at the Morenci Branch.

G. E. Sorensen, president of the Kemmerer Coal Company, Kemmerer, Wyoming, has been elected president of the Wyoming Mining Association. Other newly elected officers include **Myron L. Sisson**, superintendent of the Colorado Fuel and Iron Corporation's Sunrise mine, vice president, and **H. D. Hand**, president of Globe Mining Company, secretary-treasurer.

Jim Crosby and **Snell Burke**, both employed with Climax Molybdenum Company, Division of American Metal Climax, Inc., Climax, Colorado, left recently for a two-week tour of various mining operations in the iron and copper regions of Michigan and Minnesota.

A. W. Last, associated with Kennecott Copper Company's Western Mining Divisions Research Center, has been appointed chairman of the company's technical committee on milling practices. Other committee members are: **F. D. Thayer**, assistant mill superintendent, and **P. A. Lemke**, both of the Chino Mines Division; **M. S. Wilson** of the Western Mining Divisions; **J. L. Stevens**, mill superintendent, and **D. V. Galbiati**, both of the Ray Mines Division; **T. J. Hubbard**, Magna mill superintendent, **C. G. Quigley**, Arthur mill superintendent, **Neil Plummer**, and **J. W. Ribott**, all from the Utah Copper Division; and **W. J. Akert**, concentrator superintendent, and **Don Gunther**, of the Nevada Mines Division. The committee met recently at Hurley, New Mexico to inspect the Chino properties at Santa Rita and Hurley and to conduct discussions on the use of cone classifiers and recovery of molybdenum.

Several employees of Climax Molybdenum Company, Division of American Metal Climax, Inc. at Climax, Colorado, recently visited various other mining operations in the area to compile information relative to shaft-sinking and hoist installations. **Urban Toucher**, **Chuck Cleeves**, **San Farrar**, and **P. M. Wadsworth** inspected Homestake Mining Company's mining operations at Lead, South Dakota; **Bill Distler**, **Jim Crosby**, **Bill Nelson**, and **Bill Korsgren** visited mining operations in Price, Utah. Similar trips were made to the Sunnyside mine of Kaiser Steel Company and to operations of the Columbia-Geneva Division of United States Steel Corporation in Utah.

FRANK R. MILLIKEN has been appointed executive vice president and director of Kennecott Copper Corporation, New York. Mr. Milliken has served as vice president in charge of mining operations since joining Kennecott's staff in 1952. Prior to that time, he was employed with the National Lead Company in Tahawus, New York and General Engineering Company, Salt Lake City, Utah. **CARL K. LENZ** was also elected to the board of directors of Kennecott Copper.

THOMAS M. WARE was recently elected president of International Minerals & Chemical Corporation, Chicago, Illinois, succeeding his father, **LOUIS WARE**, who was elected chairman of the board and chief executive officer. Mr. Ware joined International in 1947 as an industrial engineer. He was later elected vice president, engineering, and in 1955 was appointed administrative vice president. Mr. Ware was elected to the board of directors in 1957 and for the past year has also handled responsibilities of the executive vice president.

James F. Roe, manager of International Minerals & Chemical Corporation's Bonnie chemical plant at Bartow, Florida, has been appointed chairman of the company's Florida Manager's Committee, succeeding **E. T. Casler**, manager of Phosphate Minerals Florida Department. Other committee members include **E. Meade Wilson**, area manager of Plant Food Division, and **Elliott Northcott**, manager of the Florida Experiment Station.

J. Brooks Robinson, vice president of the Robinson Insulation Company, Great Falls, Montana, has been elected president of the Vermiculite Institute of America. Mr. Robinson succeeds **C. H. Wendell** of Los Angeles, California. **Edward R. Murphy** of Chicago, Illinois was reelected managing director, and **Shelton W. Greer**, president of Vermiculite Products, Inc., Houston, Texas, and **L. G. McDiarmaid**, president of Insulation Industries (Canada), Ltd., Vancouver, B. C. were elected to the board of directors.

Charles Grosso has been named to succeed **Ray Jenkins** as mine superintendent for National Potash Company at Carlsbad, New Mexico. Prior to joining National's staff last September, Mr. Grosso was employed as general superintendent for Union Pacific Coal Company at Rock Springs, Wyoming. Mr. Jenkins resigned several months ago to accept a position with Phillips Petroleum Company as superintendent of mines at the uranium operations near Grants, New Mexico.

Charles C. Goddard, Jr. has been selected to replace **Edward P. Shea** as geologist of the Anaconda Company's Butte mines. Mr. Shea was recently promoted to company geologist for Montana. **Wallace A. O'Brien** will succeed Mr. Goddard as mines geologist.

David D. Baker will replace Arthur E. Granger as director of the Production Evaluation Division of the Grand Junction Operations Office, United States Atomic Energy Commission. Mr. Granger, who requested reassignment because of health reasons, will be chief of the Salt Lake City branch of the division. Mr. Baker served as Deputy director since the division was created in January.

Large mill hammers taken from the scrap pile needed a 2" to 2¼" build-up on length . . . required approximately 5 lbs. of Manganese and Stoody 100, combined. Smaller amounts of build-up and hard metal are required for subsequent maintenance.

DON'T THROW AWAY 9/10 OF EVERY MILL HAMMER

The Victorville Lime Rock Company on the Mojave Desert some 75 miles from Los Angeles operates a plant for the reduction of high grade limestone that is processed for a great many uses, from face powder base to roofing materials. For intermediate crushing the company uses a hammer mill and maintenance is, of course, the usual problem.

When a Stoody representative first called at this plant he found a scrap pile of worn hammers that had been discarded in favor of standard replacements. 9/10 of the hammer was still there but so severely worn as to have lost its efficiency. A set of nine new hammers represents an investment of approximately $200.00, so the huge scrap pile, to the hard-facing specialist, had all the appearance of a gold mine.

Tests were undertaken to determine the cost of rebuilding such hammers; a copper form was clamped around the worn end to fix the shape and the finish length. Using the semi-automatic welder running Stoody Nickel Manganese, the hammer was brought back to just under finish size, then peened and hard-faced on the end and corners with Stoody 100.

The original experimental rebuilding job proved successful and the procedure outlined has now been established as routine. New hammers measuring 4"x5"x10½" weigh 45 pounds. Between four and five pounds of Manganese and Stoody 100, a high-alloy, wear-resistant material, are required to bring a worn hammer back to size. The semi-automatic welding procedure is extremely fast, depositing three to six times as much weld metal as is possible by the manual method. After rebuilding, each hammer is carefully weighed and balanced for proper operation of the mill. As wear occurs in service, the semi-automatic welder is used to apply additional Stoody 100 free hand to maintain hammer size and shape.

By the method described hammer costs are enormously reduced and the mill's performance is considerably improved.

Further information on the hard-facing of all types of crushing equipment is provided by various pieces of Stoody literature. See your Stoody dealer (you will find him in the "Yellow Pages" of your phone book) or write direct.

George Stone, Maintenance Superintendent, shows turn-table fixture which speeds welding. Forms surrounding hammers are copper, establish hammer size and height of build-up.

Other hard-facing includes these quarry shovel teeth. Points are rebuilt with Stoody Manganese and hard-faced with Stoody 100. Note the copper mold which shapes the point.

STOODY COMPANY
11932 E. Slauson Avenue
Whittier, California

See the Stoody Operating Display at the Mining Show, San Francisco, September 22-25, 1958.

Newsmakers in International Mining

William J. Bennett has resigned as president of the government-owned Eldorado Mining & Refining Ltd. and Atomic Energy of Canada Ltd. to accept a position as executive vice president and general manager of Canadian British Aluminum Company, which recently began operating an aluminum smelter at Baie Comeau, Quebec.

Jack Bowers, consulting engineer and former general manager of the Aramayo mines in Bolivia, recently arrived in Peru to inspect the Landa copper properties near Andahuaylas.

Roy J. Henry has been elected president of Eldorado Mining & Refining Ltd., Ottawa, Canada, succeeding **William J. Bennett** who is now employed as executive vice president and general manager of Canadian British Aluminum Company. Mr. Henry was formerly manager of Eldorado's Beaverlodge operation and technical assistant to the president.

Donald C. Tretzel and **D. G. Farquharson** were recently elected vice presidents of the Kaiser Bauxite Company in Jamaica, British West Indies. Mr. Tretzel, who is works manager of the company, and Mr. Farquharson, company administrative manager, have been associated with the development of Jamaican bauxite operations since 1951, when Kaiser began building facilities in the Spur Tree and Port Kaiser on the island's south coast. Kaiser Bauxite is a wholly owned subsidiary of Kaiser Aluminum & Chemical Coproration, Oakland, California.

G. B. O. Penn, consulting mining engineer serving with Rio Tinto Management Services Ltd., was recently transferred from the company's office at Johannesburg, Union of South Africa to Salisbury, Southern Rhodesia.

R. F. Allen, mining engineer, has completed his assignment with John Taylor & Sons of London, England, and is now engaged in research work in connection with uranium prospects in Cornwall, England.

J. L. Gray is now president of the Atomic Energy of Canada, Ltd. Mr. Gray had served as vice president in charge of administration and operations with the organization since January 1954.

S. E. Malouf, consulting geologist of Toronto, Ontario, Canada, is now associated with Campbell Chibougamau Mines Limited in Toronto.

Robert C. Morel, formerly of Naco, Arizona, has accepted a position with the San Luis Mining Company at Tayoltita, Durango, Mexico.

Frederick F. Wood was recently elected assistant to the vice president in charge of publicity and advertising of the International Nickel Company of Canada, Limited, and assistant vice-president of publicity and advertising of the company's United States subsidiary, the International Nickel Company, Inc. Mr. Wood was formerly assistant to the vice president of International Nickel Company, Inc. In his new duties he will be responsible for coordination of all publicity and advertising activities for the company and subsidiaries.

Paul Gliddon has accepted a position as general manager of Salmita Consolidated Mines Limited and will take charge of company operations in Canada's Northwest Territories. Salmita plans to reopen its field office and warehouse in Yellowknife, and will begin rehabilitation and development work on the gold property on Matthews Lake adjoining Taurcanis.

H. R. Dewan has been appointed director of the Indian Bureau of Mines. Mr. Dewan, a graduate from the Indian School of Mines, Dhanbad, India, has been associated with the Bureau since it was first organized and has been acting director of the bureau for some time.

John F. Breitenbach, assistant purchasing agent for Potash Company of America in Carlsbad, New Mexico, has been transferred to the company's Canadian subsidiary, Potash Company of America, Limited, at Saskatoon, Saskatchewan, Canada.

JAMES M. MACINTYRE has been appointed master mechanic in the milling department of the Climax Molybdenum Company at Climax, Colorado. Mr. Macintyre was employed as mechanical superintendent by the Britannia Mining & Smelting Company at Britannia Beach, British Columbia, Canada, before joining Climax's staff. In his new position, he will be responsible for the maintenance in all Climax crusher and mill facilities, which process approximately 29,000 tons of ore daily at the present time.

Dr. M. J. Pandya has been selected to head the newly created State Department of Mines & Geology at Nagpur, Bombay, India. Dr. Pandya was formerly assistant professor at the Indian School of Mines, Dhanbad, India.

J. H. Harris, chief research officer of the Department of Mines in Malaya arrived in Kuching, Sarawak recently to advise the Sarawak government on developing its gold mining industry. Mr. Harris will visit gold mines in the Bau district, examine the processes used for extracting gold, and the ore containing the gold.

Don Antonio Almela Samper has been appointed director of the Geological and Mining Institute of Spain. Mr. Samper hopes to increase iron ore exploration throughout the country, and to modernize drilling and laboratory equipment of the institute.

Thomas E. Hyke has been elected president of MacLaren River Copper Corporation, College, Alaska, succeeding **F. S. Pettyjohn** who has resigned. **E. O. Albertson** was elected vice president and **J. Howard Bayless** was elected to the board of directors.

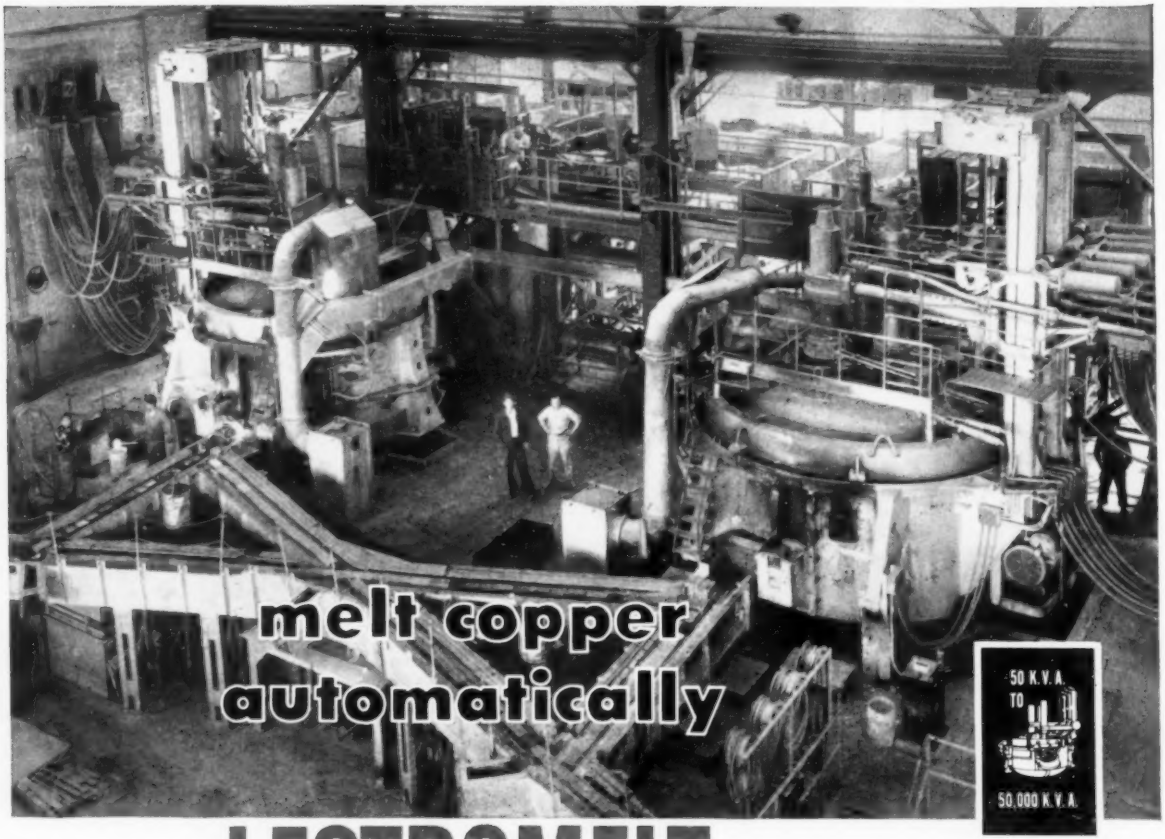
A group of steel and iron ore mining executives recently visited plants and iron ore mines in the Soviet Union as part of an exchange program with Soviet steel and iron ore technicians. The American delegation included the following: **Edward I. Ryerson**, director, Inland Steel Company, (chief of the delegation); **John A. Stephens**, vice president, United States Steel Corporation, (deputy chief of the group); **James B. Austin**, administrative vice president, Research and Technology, United States Steel Corporation; **Floyd S. Eckhardt**, assistant general manager, Lackawanna Plant, Bethlehem Steel Company; **Dr. Michael Holowaty**, chief research engineer, Research and Development Department, Indiana Harbor Works, Inland Steel Company; **Stephen M. Jenks**, administrative vice president, Central Operations, United States Steel Corporation; **Everett L. Joppa**, general manager, Lake Superior Iron Mining Division, Pickands Mather & Company; **Kenneth C. McCutcheon**, consultant, Armco Steel Corporation; **Norwood B. Melcher**, chief, Pyrometallurgical Laboratory, Bureau of Mines; **Dr. Gunther Mohling**, chief metallurgist, Research Laboratory, Allegheny Ludlum Steel Corporation; **F. M. Rich**, general manager, Indiana Harbor Works, Inland Steel Company; **Earle C. Smith**, director of research and chief metallurgist, Republic Steel Corporation; **Julius H. Strassburger**, assistant vice president, engineering, National Steel Corporation; **Irwin H. Such**, editor-in-chief, Steel Magazine; **George F. Sullivan**, editor, The Iron Age Magazine; **Dmitri N. Vedensky**, director of research and development, M. A. Hanna Company; **Michael F. Yarotsky**, division superintendent, steel production, South Works, United States Steel Corporation; **Professor M. Gardner Clark**, New York State School of Industrial and Labor Relations, Cornell University; and **Colonel Merle R. Thompson**, secretary, Foreign Relations Committee, American Iron and Steel Institute.

E. M. Brothers was recently appointed a director of Ryan Nigel Gold Mining & Estate Company, Limited, Johannesburg, Union of South Africa. **J. A. Wallisch** is now a director of Unified Gold & Exploration Gold and Exploration, Ltd., also in South Africa.

William Mercer has been appointed superintendent of the Iron Ore Company of Canada's ore transfer dock at Contrecoeur, Quebec, Canada. Mr. Mercer was formerly employed with Quebec Iron and Titanium Corporation at Sorel, Quebec.

H. R. Cooke, Jr., geologist and engineer of Reno, Nevada, is presently on assignment in Costa Rica and Cuba for **Arnold H. Miller, Inc.**, consulting engineers of New York, New York.

Ola Holtan has resigned from his position with the Department of Mining and Metallurgy, University of Alberta, Edmonton, Canada. Mr. Holtan has not announced his future plans.



LECTROMELT FURNACES *prove economical in continuous cycle operation*

Refined copper can be melted and cast in a continuous cycle with Lectromelt furnaces—they're especially suited to automatic operation. Certain casting cycle stages are eliminated and time required for others is reduced. High quality is maintained at reasonable cost.

Data obtained on Lectromelt furnaces operating in United States, Canada, South America, Sweden and South Africa disclose these facts: Continuous flow of copper contains an average of only .01% oxygen because of excellent control of furnace atmosphere. Sulphur and iron contamination is prevented by (1) thoroughly cleaning cathodes prior to melting, (2) heating by direct-arc, (3) using high-grade refractories.

Cost of furnace operation is low. Power consumption varies between 200 kwh and 300 kwh per ton. Electrode consumption averages 3 to 4 pounds per ton. Maintenance is minimized to about one hour per week.

For engineering assistance on similar melting or refining problems, write Lectromelt Furnace Division, McGraw-Edison Company, 324 32nd Street, Pittsburgh 30, Pennsylvania.

McGRAW-EDISON **Lectromelt®**

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a progress report—

Glen Canyon Dam Project to open vast new area

Work on huge Upper Colorado River Project well under way

When completed some six years hence, the giant Glen Canyon Dam, Reservoir and Powerplant Project will unlock the riches of a vast, 10,000-square-mile area.

The high concrete gravity arch dam, rising 700 feet from bed-rock, will contain 5,493,000 cubic yards of concrete. Power from the 900,000 KW power plant, located 470′ downstream from the dam, will make possible the development of huge resources of fuel, oil, minerals—including uranium—and timber.

When filled to capacity the 28,000,000-acre-foot reservoir will stretch 186 miles up the Colorado and 71 miles up the San Juan, a major tributary of the Colorado. Basically, this project is for river control and power generation.

Largest single dam contract on record

The $107,155,222 contract for the Glen Canyon Dam and Powerplant, largest ever awarded by the U.S. Bureau of Reclamation, went to Merritt-Chapman & Scott Corporation, New York. On April 29, 1957, the day the contract was awarded, Merritt-Chapman & Scott signed a contract with Fairchild for aerial mapping of the dam site, reservoir and areas adjacent to the dam site. Flying operations began on May 5, *just six days later!* Advance copies of flying results were delivered on May 26. Other detailed data followed soon after.

Scale of maps for Glen Canyon

Reservoir: 1″ equals 400′, 10′ contours
Dam site: 1″ equals 50′, 2′ contours
Areas adjacent to dam site: 1″ equals 200′, 5′ contours

During the past 34 years, Fairchild crews have flown similar mapping assignments all over the free world. Results produced from this experience have led thousands of Fairchild clients to say . . . if you want it done *fast* and *right the first time*, you can depend on Fairchild.

Site of the 700′ Glen Canyon Dam, second in height only to Hoover Dam (726′) is located 12 miles downstream from the Arizona-Utah border—370 miles upstream from Hoover Dam.

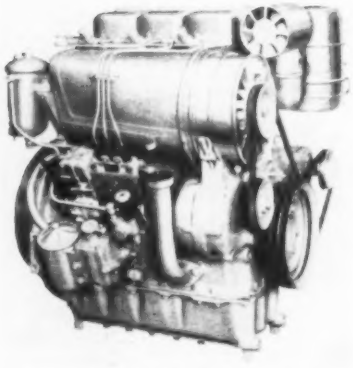
Walls of the canyon at the dam site are 650′ high with overhang in places. This necessitated flight paths parallel to the walls but offset to see under the overhangs.

FAIRCHILD
AERIAL SURVEYS, INC.

Los Angeles, California: 224 East Eleventh Street • **New York, New York:** 30 Rockefeller Plaza • **Chicago, Illinois:** 111 West Washington • **Long Island City, New York:** 21-21 Forty-First Avenue • **Tallahassee, Florida:** 1514 South Monroe Street • **Boston, Massachusetts:** New England Survey Service, 255 Atlantic Avenue • **Shelton, Washington:** Box 274, Route 1 • **Houston, Texas:** 3325 Las Palmas • **Birmingham, Alabama:** 2229 First Ave. North

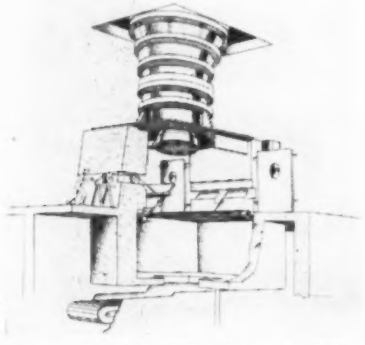
PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.



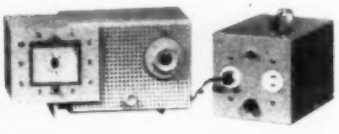
New Air Cooled Diesels Developed by German Firm

Three new models of Deutz air-cooled Diesel engines have been added to the existing line, it was announced by the Diesel Energy Corporation, sole United States representative of Kloeckner-Humboldt-Deutz A. G. The new models are designated the F3L 712, F4L 712, and F6L 712. There are 3, 4 and 6 cylinder, vertical in-line engines. All utilize the unit cylinder construction principle. Continuous 24-hour output ratings of the engines at 2,300 RPM are 33 BPH, 44 BPH and 90 BPH. For details contact Diesel Energy Corporation, 82 Beaver Street, New York City.



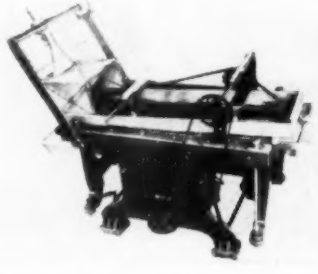
Retractable Platform Will Speed Crusher Maintenance

To expedite gyratory crusher maintenance, an improved foundation utilizing a retractable working platform has been developed by Allis Chalmers plant design engineers. The foundation and platform were designed in connection with bottom discharge crushers 30-by 55 inches or larger. The platform consists of 2 hinged floor sections which can be pulled up by service crane or hand operated winch to fit the inside wall of the foundation. When up, the steel-lined platform protects the foundation by taking the abrasive wear of crushed material. With the new arrangement only enough product need be withdrawn below the crusher to lower the working platform. When down, extended car rails drop into seats provided in the foundation and the eccentric cart can be rolled into position. New arrangement results in greater speed and safety during servicing and does away with necessity for constructing a work floor for maintenance. Write the company at Milwaukee 1, Wisconsin for details.



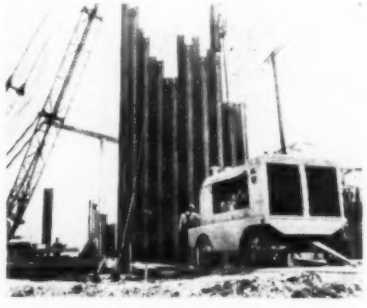
New Power Inverter Will Convert DC to 115 Volt AC

A new midget-size power inverter for converting DC to 155 volt AC for running utilities and equipment at remote locations has been announced by Lincoln Electronics, Anaheim, California. The unit measures 4-by 5-by 8 inches and employs a transistorized power circuit to convert DC battery power to AC for running test equipment, light plants, etc. all from one source. Models are available for 12 and 24 volt DC input for 115 volt, 60 cycle 200 and 500 watt output. Circle No. 54 for details.



Screen Separator Offers New De-Watering Method

A separator made by Russell Constructions Ltd., London, England, is said to offer a new approach to liquid-solids separation. The firm reports that the Russell separator is capable of straining out solids suspended in a liquid medium at rates of up to 15,000 gallons per hour through a 100 mesh screen. The screen is given a gyratory motion in such a manner that while the screen itself is not rotating, each point on its surface is describing a small diameter circle at about 1,500 cycles per minute. A specially designed nozzle imparts turbulence holding the solids in suspension (preventing blinding) while the liquid is rapidly forced through the screen. Solids are propelled over the dry part of the screen towards the discharge end. Circle No. 59 for further details.



Portable Compressor Will Deliver 1,200 CFM Free Air

What is believed to be the world's largest portable rotary air compressor manufactured to date is now available from Le Roi Division, Westinghouse Air Brake Company. The new Le Roi 1200-RD2 is a twin unit rated at 1,200 cfm of free air compressed to 100 psi. The unit is said to be ideal for large tunnel jobs, pile driving, large-hole open pit drilling, and multiple shaft jumbos. Each unit of the twin assembly has its own independent controls and can be operated for 600 cfm delivery or together for 1,200 cfm delivery. Twin unit design also provides interchangeability of both engine or compressor parts servicing. For details circle No. 56.

Motion Indicator Actuates Alarm or Control Switches

A new low-cost motion indicator is available from the Bin-Dicator Company. Called Roto-Guard, the device is a means of converting motion of various types into a signal. The signal impulse can be used to energize an alarm or to operate control switches automatically. Roto-Guard is connected to any slow turning shaft, and as long as the driven shaft rotates normally, the indicator registers normal operation by means of a circulating pump and pressure actuated switch. The protective unit can be wired into an interlock system. Price is about $75.00. For details circle No. 58.

MICROSPLITTER patterned along the lines of a Jones Riffle is used to reduce moderate-size bulk samples to fractional gram size reports Sepor Laboratory Supply, makers of the unit. A 3-pound monazite sand sample was worked down to less than 0.5 gram in about 2 minutes according to the manufacturer. Also available with the microsplitter is the Vibra-Pad, a vibrator which can be used with samples that show a tendency to bridge while being split. Circle No. 1 for further details.

SCALE FOR CONVEYORS, made by Thayer Scale Corporation, is said to totalize continuously and accurately, and to recalibrate linearly with direct setting by just placing a known weight on the scale platform. Thayer reports that there are no knife-edge pivots to wear down. Circle No. 3 for further details.

PLASTIC REAGENT FEEDER made by Clarkson Company, is described by a new bulletin No. 584. It is made of PVC (polyvinyl chloride) for controlled feeding of acids and other corrosive liquids. Circle No. 4 for your copy.

REDESIGNED MOTORS: Allis Chalmers redesigned line of TEFC motors features built-in air-to-air heat exchanger cooling, and capsule-mounted, split-sleeve bearing for direct coupling. They are also available with cartridge-mounted ball or roller bearing for belt or chain drives. Copies of bulletin 51B8991 are available from the company at Milwaukee 1, Wisconsin.

WEIGH-FEEDER equipment made by Syntron Company is fully described in a new catalog which gives data and specifications on 9 gravimetric feeders, automatic batch weigh plants and bag weigh machines. Copies are available from the company at 166 Lexington Avenue, Homer City, Pennsylvania.

ELIMINATE CORROSION with Sandvik Coromat SR, is the title of a folder #E-567 recently released by the Atlas Copco Companies, to describe their new process for protecting drill steels from corrosion caused by moisture. For your copy write to Atlas Copco Pacific, Inc. 930 Brittan Avenue, San Carlos, California. Use reader service card.

RUTH DIESEL EXHAUST is the title of an interesting booklet prepared for you by the Ruth Co., of Denver, Colo. Besides containing excellent information of early mining history, the booklet explains the functions and operation of the Ruth gas conditioner for underground Diesel power. Circle No. 2 for your copy.

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JULY 1958 **NOT GOOD IF MAILED AFTER SEPTEMBER 25**

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WET REAGENT FEEDER: Denver Equipment Co. has published a four-page bulletin showing their Model 12-A Denver Wet Reagent Feeders and Cone Type Dry Feeders. The wet feeder provides continuous operation, light weight and laboratory accuracy with feeding rate up to 2,250 cc per minute. Circle No. 25 for copy.

SPECIALIZED BAGS for explosives are described in a new illustrated booklet now being offered by the Chase Bag Company, 309 W. Jackson Blvd., Chicago 6, Illinois. Among the bags manufactured for mining are laminated burlap bags, multiwall paper bags and polyethylene plastic bags. Use reader service card for further information. Write company direct.

TRANSMISSION PRODUCTS: The Jeffrey Manufacturing Company, Columbus 16, Ohio, has available new catalog #914. The 88 page catalog features Jeffrey transmission products and their uses in elevating and conveying machinery. For your copy, write company using reader service card.

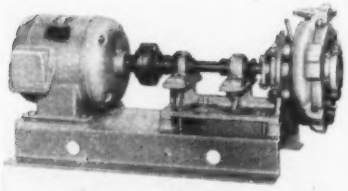
MOTOR STARTING FLUID: The Wilco Company has recently published an interesting bulletin called "The Story Behind and the Future of Sure Fire Motor Starting Fluid for All Gasoline and Diesel Engines." Circle No. 7 for your copy of this interesting bulletin #83-40.

INTERNATIONAL HARVESTER COMPANY has announced that it now has available a new 16-page catalog on its Payscraper line. The booklet leaves no question unanswered as to why IH feels its Models 75 and 55 Payscraper Units are excellent investments in the self-propelled, rubber-tired earthmover field. For your copy write the company at 180 North Michigan Ave., Chicago, Illinois. Use handy reader service card.

FLOWSHEET STUDY discusses recovery of graphite. The Denver Equipment Company, P.O. Box 5268, Denver 17, Colorado, has published a flowsheet study describing the recovery of graphite by Denver "Sub-A" Flotation. For your copy of this bulletin write to DECO using handy reader service card.

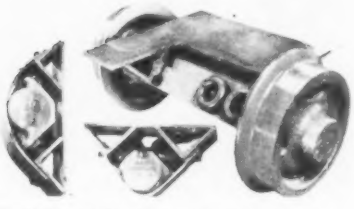
DEVELOPMENT AND USE of Core Barrels in Diamond Drilling is the title of an eight-page booklet describing the various barrels used by core drillers. The book, published by E.J. Longyear Co., includes information on seven types, from simple single tube barrels to double tube, swivel type barrels, and including the Wire Line Core Barrel. For your copy write to the company at Minneapolis 2, Minnesota. Use reader service card.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. NO postage necessary if mailed in U. S.



Nagle Pumps Offers New Series For Abusive Service

Nagle Pumps, Inc., 1250 Center Avenue, Chicago Heights, Illinois, has announced a new line of pumps designed for abusive applications. Designated as the K series, pump characteristics include applications involving abrasion or corrosion problems or the handling of hot liquids. The exposed shaft design makes the K series especially desirable for the latter. Contact the company for further details.



Rubber Suspension For Long Mine Car Life

To offset coil spring breakage caused by corrosion and metal-to-metal wear, a new rubber suspension has been developed that provides long-lived, smooth-carrying effectiveness. This new type of springing is in the form of natural rubber rings which completely isolate the axle box from the rest of the chassis except on a rebound. The rings provide resilience fore, aft and laterally, as well as vertically.

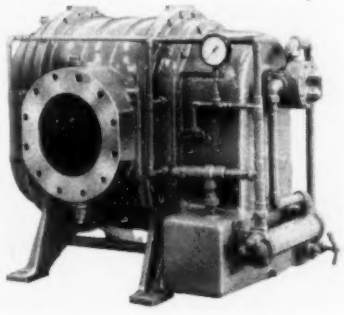
Rings capable of handling loads up to 7,500 pounds per pair are now available. For heavier loads, rings mounted abreast on suitable bearings can be used. This advance in mine car suspension is fully described in the current issue of Rubber Developments. For your free copy write the Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D.C.

Tractor Powered by a High Speed Gas Turbine

An experimental crawler tractor powered by a high speed gas turbine is disclosed by Allis-Chalmers Mfg. Co., Milwaukee.

Inside the tractor's engine compartment, a Boeing 502-10C gas turbine power unit has replaced the conventional Diesel engine in this experimental version of what may be the crawler tractor of the future.

According to A-C, the tractor has been developed for research purposes only. The design of the gas turbine involves the equivalent of a "built-in" torque converter. Ability of the turbine to deliver the range of speed and flexibility of power required for successful tractor operation will be thoroughly tested and evaluated by A-C. Net horsepower by the turbine is said to equal its Diesel counterpart. External appearance differs little from Diesel models.



A New Design Offered For Blowers and Gas Pumps

A completely new blower, utilizing the basic and well-known Roots rotary positive principle has been developed by Roots Connersville Blower, Division of Dresser Industries, Inc. It is said to introduce major design and operating advantages for more efficient handling of air and gas. The new blower features a vertical arrangement of the impellers providing horizontal inlet and discharge connections for more convenient piping. The drive shaft extends from the lower impeller to match more closely motor shaft heights. Circle No. 52 for more details.

Traction Booster Adds Weight to Driver Wheels

Athey Products Corporation announces a new "Traction Booster," an attachment for the Caterpillar DW 20 (Series E) tractor. The Athey "Traction Booster" imposes approximately 31 percent more weight on the driver wheels, by transfering weight from the tractor steering axle and from the trailing unit axle. The unit is an independent hydraulic system and is mounted on the tractor between the hitch and the tractor chassis. It is controlled by the operator through a simple, 1-lever valve. It is offered for field mounting only. Circle No. 53 for complete details.

Notes From The Manufacturers

Hugh C. Williams is now general manager of the Miners Foundry and Manufacturing Company of Nevada City, California, following a recent reorganization of the company. Other principals of the new organization are George T. Rua, plant superintendent; Charles L. Strom, director of sales, and John J. Pfeiffer, special representative.

T. A. Haller has been elected to the newly created position of vice president in charge of engineering of the J. I. Case Company of Racine, Wisconsin. Mr. Haller will be in charge of the new Case Research and Development Center in Racine, and will have overall supervision of engineering for both the Agricultural and Industrial Divisions.

Paul Norman Clawson has accepted a position with International Minerals & Chemical Corporation in Chicago, Illinois, as geologist in the mining and exploration department. Mr. Clawson recently received a master's degree in geology from the Montana State University, where he has been employed as an assistant instructor.

Babcock and Wilcock of New York City plans to expand and modernize the alloy and stainless steel making facilities of its Tubular Products Division. A new electric arc furnace and associated equipment will be included in the $12,000,000 expansion program.

A. Phillip D'Haem has been appointed director of export sales for Gar Wood Industries, Incorporated at Wayne, Michigan. Mr. D'Haem joined Gar Wood in 1947 and prior to his present appointment was European director of sales for the firm with headquarters in Paris.

A new division has been created by C & D Batteries, Inc., to undertake basic research on storage batteries. **Dr. Eugene Willihnganz,** who has done research work in the battery industry for 25 years, will head the new C & D Research Division which will supplement the company's developmental laboratories.

John F. Estes was recently appointed District sales manager for the Salt Lake City Territory for Stephen-Adamson Manufacturing Company. Mr. Estes joined the Stephens-Adamson Los Angeles Division in 1954 as consulting and sales engineer, serving in this capacity until his present appointment.

More capacity, less weight, longer service life, and lower costs—these are the advantages you get by using USS "T-1" Steel in mining equipment.

Dippers that ram through rock

built stronger, tougher and lighter with USS "T-1" Steel

Did you ever cling to the "crow's nest" of one of the new giant shovels and feel it ram into a wall of rock and shale? The big machine shudders, then braces its feet and digs in with all its tremendous mechanical muscle. The dipper becomes a real battering ram—and you wonder how any steel can stand such punishment, day after day.

United States Steel engineers and metallurgists asked the same question, and developed a special steel, USS "T-1" brand. This steel can take terrific shock and impact abrasion. It's extremely tough—even at 50° below zero. And it is now available with more than three times the yield strength of structural carbon steel—100,000 psi minimum.

This great strength permitted a weight saving of 40 tons in one large shovel where "T-1" Steel was used in the dipper, dipper stick, bail and crowd rack. In spite of the high strength, shovel manufacturers had no difficulty welding, forming and machining this quenched and tempered alloy steel.

USS "T-1" Steel can help you. Consider it where you need a steel with great strength, extraordinary toughness, or resistance to impact abrasion combined with ease of fabrication. Write for our book *USS "T-1" Steel*. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

Immediate Delivery. USS "T-1" Steel products are now immediately available in minimum mill quantities. Reason: our new continuous heat-treating line is now in full operation. It assures better delivery as well as top quality.

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United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS United States Steel

Putnam Discovery Expands Tennessee Zinc District

With Putnam Exploration Company's recent discovery of ore grade zinc mineralization in Hawkins County, Tennessee, the new lead-free zinc district in Tennessee has been considerably expanded. The area under exploration by Putnam lies along strike from New Jersey Zinc Company's Treadway mine. On the accompanying map, this new district is shown as the cross hatched section. New Jersey Zinc's Treadway mine and mill are at the northeast end. At the southwest end is Putnam's operation.

The old, well known Mascot-Jefferson City zinc district is indicated by the dotted area. This district includes American Zinc Company of Tennessee's Mascot mine at the south end, American Zinc's Friends Station and Young mines near the center, and at the northeast end are American Zinc's Coy and Grasselli mines, New Jersey Zinc's Jefferson City mine, and United States Steel Corporation, Tennessee Coal and Iron Division's Jefferson City mine.

Zinc is the first metal Putnam Exploration has prospected for, using a Defense Minerals Exploration Administration loan. According to reports from Tennessee, National Lead Company was formerly associated with Putnam in the venture.

The company, headed by B. H. Putnam, has limestone and glass sand operation in other states and headquarters in Marietta, Ohio.

Shook and Fletcher Supply Company has placed its new iron ore processing plant in operation at the company's *Kingsbury* mine near Teresita in Howell County, Missouri. This is the first heavy media separation plant in this area. The ore will travel 350 feet from the mine truck, through the crusher, washer, heavy media section, and jig section until it reaches the shipping trucks. It is then trucked to railroad loading docks at Montier, Missouri. When in full production, the operation will have a capacity of six railroad carloads daily. The plant was installed under the direction of W. D. Hill and will be operated under the direction of Allen Grissom.

Climax Molybdenum Company, a division of *American Metal Climax Inc.*, is undertaking construction of a $1,000,000 plant for production of molybdenum metal and molybdenum-base alloys. Located at Coldwater, Michigan, the plant is scheduled to go into operation during the latter part of this year. Equipment will include two vacuum arc consumable electrode melting furnaces developed especially for molybdenum metal production at the company's research laboratory in Detroit.

American Zinc, Lead and Smelting Company at St. Louis, Missouri reports that slab zinc production for company account during the first quarter of 1958 was reduced by 30 percent. Because of large slab zinc stocks in the hands of smelters, the company may make further drastic curtailment of slab zinc production during the summer months.

Girdler Construction Division of *Chemetron Corporation* has been authorized by *Cuban American Nickel Company* to proceed with engineering and equipping of a hydrogen sulfide generating unit at Port Nickel, Louisiana. The hydrogen sulfide will be used to refine nickel and cobalt sulfides shipped from Moa Bay, Oriente, Cuba. Girdler recently engineered a 60-ton-per-day liquid hydrogen sulfide plant for ore processing at the Cuban end of the $119,000,000 nickel-cobalt project. Cuban American is a subsidiary of *Freeport Sulphur Company*.

St. Joseph Lead Company's new mine research department is engaged in developing ways of mining ore-bearing pillars in the company's present mines, as well as seeking methods of increasing efficiency in the development of new mines.

National Lead Company has decided to reduce output at its Fredericktown, Missouri operations by about half through reduction in the work schedule. The refinery will continue to operate on a seven-day week, but the mine and mill will be on a five-day schedule.

Lobeth Corporation of Chicago, Illinois reports it has a process for economic recovery of alumina from domestic clays. The firm is exclusive licensor for this patented process which reportedly produces 99.9 percent alumina from clay, kaolin, leucite, feldspar, etc., at a lower cost than is found in the Bayer bauxite process. With this process, Lobeth says it is possible to develop ores of low alumina and high silica content which cannot be utilized by the processes heretofore used. Italian pilot plant tests have extended over a period of more than six years to confirm these reports. An important byproduct, Portland cement, can be produced from the residue of the process, according to Lobeth.

The *Selenium and Tellurium Development Committee* is sponsoring a research program at *Battelle Memorial Institute* to further understanding and use of these two nonmetallic elements. The Committee includes eight of the major Western Hemisphere producers of these copper and lead byproducts. Corporations represented are *American Metal Climax, Inc.; The Anaconda Company; Cerro de Pasco Corporation; The International Nickel Company, Inc.; Kennecott Copper Corporation; Noranda Mines Ltd.; Phelps Dodge Refining Corporation;* and *United States Smelting Refining and Mining Company*.

A major research program is being launched under the direction of the *Industry Development Committees* of the *American Zinc Institute, Inc.* and the *Lead Industries Association*, and sponsored by zinc and lead producing companies in the United States, Canada, Mexico, Great Britain, South America, and Australia. It is hoped that the program will lead to creation of "appropriate new knowledge and potential new products and uses aimed at increasing the world-wide consumption of zinc and lead."

American Zinc Company of Tennessee is planning to build partial mills at two of its Jefferson County, Tennessee zinc mines. The mills will contain principally primary crushing equipment and heavy media units. The partially concentrated ore will then be shipped to American Zinc's mill at Mascot. In this way, freight costs will be materially reduced.

Ormet Corporation's $110,000,000 reduction plant on the Ohio River near Clarington, Ohio has gone into production as the smelter reached 80 percent of completion. When finished at the end of this year, output will be 180,000 tons of aluminum per year. The first potline reportedly was producing 99.45 percent metal almost immediately after startup. Four other potlines, each able to pour 36,000 tons a year, are starting production at 60 days intervals. The ore comes from Surinam under a long-term contract with N.V. Billiton Maatschappij. It is delivered to the new $55,000,000 plant at Burnside about 30 miles south of Baton Rouge where it is converted to alumina and then shipped to the smelter in a fleet of pneumatic loaded covered barges. Adjacent to the smelter is the $60,000,000 aluminum rolling mill which started rolling flat and coiled products last October, but will not reach its first phase capacity of 60,000 tons annually until later this year. This mill's second-phase will be completed in 1960, doubling plant capacity. The project is a joint undertaking of *Olin Mathieson Chemical Corporation* and *Revere Copper and Brass, Inc.*

The *Joseph A. Holmes Safety Association* has adopted new and stiffer standards under which individuals, mines, and mineral-processing plants can qualify for safety awards. Advances in technology and lessening of certain hazards have made it easier to comply with the standards set up for awards, and so the standards have been upgraded to assure that the Association's awards retain their values as a safety incentive. The new rules will be effective in the 1958 safety year, and apply only to awards granted individuals, mines and plants—qualifications for individual and group hero awards remain unchanged. Here are the changes: 1. Awards based on tonnage produced without a fatality are abolished. (Mechanical mining methods have resulted in increased output per man-shift. The Association feels it is more realistic to use man-hours worked—the exposure period—when comparing various mine records and experiences). 2. Permanent total disabilities will be included with fatalities when considering safety achievements. (Both

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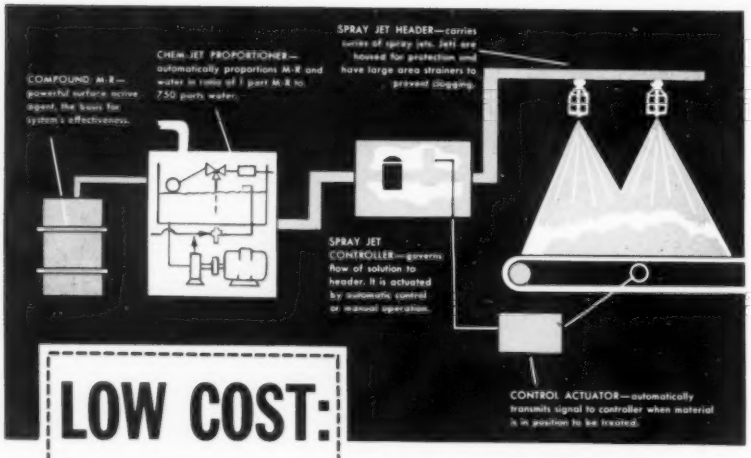
COMPOUND M-R—powerful surface active agent, the basis for system's effectiveness.
CHEM-JET PROPORTIONER—automatically proportions M-R and water in ratio of 1 part M-R to 750 parts water.
SPRAY JET HEADER—carries series of spray jets. Jets are housed for protection and have large area strainers to prevent clogging.
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represent a permanent loss of manpower to a mine and to the mineral industries. Also, both receive equal consideration in computing severity rates). 3. The following minimum man-hours worked without a fatality or permanent total disability are adopted: 2,000,000 (formerly 1,000,000) for underground mining operations; 3,000,000 (formerly 2,000,000) for open-cut mining, open quarrying, and petroleum-drilling operations; 8,000,000 (formerly 2,000,000) for plant and surface operations other than open-cut mines and quarries; 10,000,000 for the petroleum industry (except drilling), smelters, and reduction works. (Formerly there was no set requirement as to the number of man-hours). 4. The following minimum man-hours worked without a disabling injury are adopted: 400,000 (formerly 250,000) for underground mines and petroleum-drilling operations; 600,000 (formerly 350,000) for open-cut mines and quarries, plant and surface operations, the petroleum industry (except drilling), smelters, and reduction works.

Allied Chemical & Dye Corporation has changed its name to *Allied Chemical Corporation* because the directors believe it more accurately describes the breadth of the company's activities, and does not single out a particular division or field of activity.

Pittsburgh Pacific Company of Hibbing, Minnesota paid $650,000 for the *Ringwood* iron mines in New Jersey. The mines had been producing ore since Revolutionary days. They were taken over by the *General Services Administration* in 1956 after the *Ringwood Iron Mines Corporation* defaulted on a $1,400,000 government-held mortgage.

Another iron-manganese deposit has been found in Maine. This occurrence was located through a geologic and aeromagnetic reconnaissance survey made by the *Geological Survey of Maine Department of Economic Development*. The initial discovery centers around southeastern Penobscot County, and has been followed for about eight miles. The rock appears to be similar to the manganese ore of Aroostook County. The Department has recently released a new publication called "Bibliography on Maine Geology 1836-1957" which may be purchased from the Department offices in Augusta, Maine for $1.10.

Tennessee Coal & Iron Company, subsidiary of the *United States Steel Corporation*, is curtailing an extensive zinc exploration program in Grainger County, Tennessee. The seven diamond drills employed in prospecting for the ore, 2,500 feet deep, are being moved out of the leased area as the holes are completed. The current poor market for zinc is blamed for the curtailment. The firm is currently operating its Jefferson City, Tennessee zinc mine on a four-day week.

Heavy Minerals Company plans to suspend mining operations in its South Carolina mineral holdings because of the depressed world market for titanium, zirconium, and associated metals. This cutback will be reflected in lowered operations at the company's rare earth processing plant at Chattanooga, Tennessee.

Youngstown Sheet & Tube Company is building a new iron ore sintering plant at its Indiana Harbor Works in Indiana. Capacity of the new plant is 4,200 net tons of sinter product daily, with provision for doubling output at a later date. *Arthur G. McKee & Company* have the

contract for the work. Completion is scheduled for spring of 1959.

IRON RANGES

Oliver Iron Mining Division of *U.S. Steel Corporation* will operate all four ore concentrating plants and four crushing and sizing facilities this season, in addition to its experimental taconite concentrating and agglomerating plants at Mountain Iron and Virginia, Minnesota. Two new heavy media sections now under construction at Coleraine and Hibbing will go into operation this year. New sizing units at Virginia and Chisholm, completed last year, will also be in operation. On the Eastern Mesabi, mining operations will be carried on at the *Stephens* mine near Aurora, the *Rouchleau* group in the Virginia area, and *Pilotac* taconite mine at Mountain Iron. In the Central Mesabi, ore will come from the *Sherman* mine group near Chisholm and the *Monroe* and *Hull-Rust* mines at Hibbing. On the Western Mesabi, Oliver will operate its *King*, *Plummer*, and *Arcturus* mines. Active underground operations will be continued at the *Pioneer* and *Soudan* mines on the Vermilion range. These mines produced ore for stockpile all winter.

The *Krueger* iron ore mine near Chatfield, Minnesota has entered its fourth shipping season. *Schroeder Mining Company*, operator, has installed a Wemco classifier and Remer jig in the plant for the new season.

The iron ore fleet on the Great Lakes got off to a slow start in 1958. On an average, boats have moved into service about four to six weeks later than last year. As of May 20th, only 85 of the 251 U.S. registered vessels had entered service for the new season, while a year ago all boats had gotten under way at that time. The new loading facilities of *Erie Mining Company* at Taconite Harbor, Minnesota loaded the steamer "John Sherwin" with its maiden cargo on May 6. This boat was christened May 1 following construction at Toledo, Ohio. Dock facilities at the Great Northern Railway dock in Superior were activated on May 2. The Northern Pacific docks in Superior, Wisconsin opened their season on May 11, while the Two Harbors, Minnesota docks of the *Duluth, Missabe and Iron Range Railway* started loading operations on May 14. The Duluth docks of Duluth, Missabe and Iron Range Railway started loading on May 17.

The first *Pittsburgh Steamship* vessel to carry ore during the 1958 season was the "Cason J. Callaway," which left Two Harbors, Minnesota for Gary, Indiana with a full shipment on May 18.

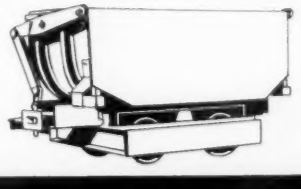
Reserve Mining Company's mechanical maintenance department at Silver Bay, Minnesota set a new safety record within the company when it reached 1,000,000 manhours without a single injury that kept a man from his job. Particularly significant was the fact that this record was attained in a new plant, the large taconite operation at Silver Bay, with many of the 360 men who made the record new and inexperienced. Many were still receiving on-the-job training while the record was being established. S. A. Huffman, department superintendent, reported that the department had not had a lost-time accident since October 23, 1956.

Hecla mines Uranium Ore with 41 cu. ft. GRANBYS

Hecla Mining Company opened their Radon property with 20 small Granby-type Card cars designed specifically for this underground service. Hecla is operating one of the deepest uranium mines in the U.S.A. with a well planned mine plant.

The underground haulage involves up to 300 tons per day of 0.7 percent U_3O_8 ore. Each Card Granby car has a capacity of 41 cu. ft. and is built on 24" gauge. When the Radon orebody is exhausted, the cars will still be able to "outlive" another Hecla mine of comparable size without major repair or replacement.

Such haulage efficiency and long life are yours whenever your choice is Card. Our engineers are at your service on any production haulage problem.



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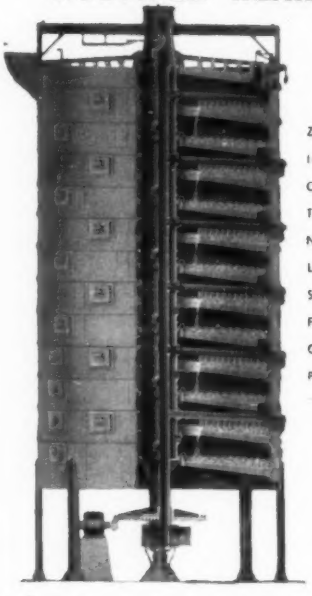

ROASTING
CALCINING
DRYING

ZINC ORES	QUICKSILVER
IRON ORES	MAGNESITE
COPPER ORES	LIMESTONE
TIN ORES	MOLYBDENUM
NICKEL ORES	BONE CHAR
LEAD ORES	DIATOMITE
SODA ASHES	LIME SLUDGE
FULLERS EARTH	MAGNESIUM
CARBON	CLAY GRANULES
PYRITE	ANTIMONY

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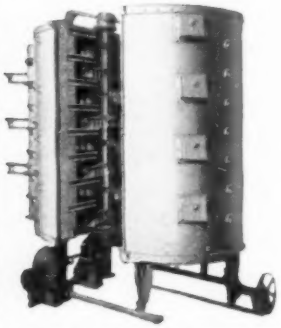
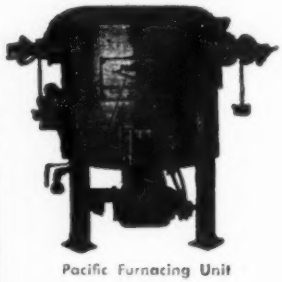
NUMBER OF HEARTHS, 1-16



Pacific Laboratory Furnace

PACIFIC LABORATORY FURNACE

Manufactured in two sizes—36" and 54" inside diameters having 6-8-10 Hearths and include the same features as the commercial size furnace.



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Higher shell height. Three gas burners. Provision for conversion to muffle unit. Small volume roasts at any desired temperature

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Complete detonation . . . no unexploded caps or powder. Cannot be set off by friction, sparks, ordinary shock; even a direct hit by lightning did not detonate Primacord.

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Lowest overall cost because you get full efficiency from the explosive—no waste; and better fragmentation with less powder. Only one cap required—no cap in the hole.

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United Western Minerals Company and *The Golden Cycle Corporation* have applied jointly to the *Atomic Energy Commission* for a milling contract which would enable them to construct additional facilities at the Carlton mill in the Cripple Creek district of Colorado for the processing of Front Range uranium ores.

Construction has started on a uranium processing mill near Canon City, Colorado for the *Cotter Corporation*, and the mill is expected to be in operation by August 15. The mill has a capacity of 50 tons of ore daily but the company is seeking permission to expand the capacity to 200 tons daily.

Exploratory work has been begun by the *Knight Mining Corporation* at the *New York* mine on Gibson Hill near Breckenridge, Colorado. A 1,200-feet-long trench will be bulldozed down to bedrock. The company plans to diamond drill three core holes. Earl Knight, president, said that government geologists believe the chances of hitting valuable deposits of lead and zinc are good. The company recently received a $18,000 loan from the *Defense Minerals Exploration Administration*.

Marcy Shenandoah Corporation of Silverton, Colorado has had two men in the Silver Lake Basin sampling lake tailings. Supplies were dropped to them by plane. The tailings in the lake bed were deposited there many years ago after ore treatment in stamp mills. Recovery processes have greatly improved since then and it may now be worthwhile to pump the tailings to lower areas for settling, and then to haul to the company's Mayflower mill for final treatment.

Canyon Gold, Inc. of Denver, Colorado is increasing its capitalization so that it may enter the quicksilver processing field.

New Jersey Zinc Company's Empire Zinc Division has discontinued the zinc concentrate roasting operations at its Canon City, Colorado plant.

Among the recent firms incorporated in Denver, Colorado are: *Crystal Beryl Corporation* by Gilbert C. Maxwell, Lucy H. Pier, and Dorothy Kercheval, and *Colorado Plateau Exploration Company, Inc.* by Raymond H. Gengler, Ethel Mocker, and N. Louise Anderson.

The Colorado Supreme Court has ruled that a mineral discovery through means of a geiger counter or a scintillator is valid in filing claims. Justice Leonard V. B. Sutton, in a majority opinion, noted that mining laws and their court interpretations have not kept pace with the atomic age, or with the problems involved in prospecting for radioactive minerals. He said a mineral discovery is valid if the radioactivity of a count is similar to that found on the ground or from the air above the ground, a chemical assay supports the radiometric reading showed, and there is similar rock in place or along the same vein or lode. The opinion affirmed a Park County District Court decision that a group of ranchers headed by J. B. Fitzsimmons had a valid claim under the discovery law, even though two other men, Warner D. Dallas and Robert J. Ernst, obtained a mineral lease from the State Land Board for the same land. The Fitzsimmons group found high readings with a geiger counter and posted notices on the claim on Feb. 27, 1955. Dallas and Ernst leased the land from the State Land Board on April 4, 1955. Judge Sutton ruled that the State Land Board did not have the right to lease the land being held by others under the mining laws.

Mines Development Inc. is spending $350,000 on improvement of its uranium mill at Edgemont, South Dakota. The daily capacity will be increased from 300 to 400 tons.

Iron ore deposits near Nemo, South Dakota are reported to be under development by *Colorado Fuel & Iron Corporation*.

A uranium prospect in San Juan County, Utah has been leased by *Shattuck Denn Mining Company* from the *Kerr-McGee Oil Industries Inc.* and *Anderson Development Company*. The firm has been seeking a new prospect since its lease on the *Club Mesa* property near Uravan, Colorado expired, and was not renewed by the AEC because of a surplus of uranium. Kerr-McGee had drilled the Utah prospect and outline an ore body; this ground was resurveyed and re-evaluated by Shattuck Denn who has now decided to sink an 800-foot shaft for production.

The newly organized *Utah Salt Company* will harvest, process, and sell salt from the ponds of *Bonneville Ltd.* at Wendover, Utah as a result of a recently negotiated mining lease. Utah Salt will build a $250,000 plant near the Bonneville property where Bonneville recovers potash in a solar evaporation process. A substantial amount of salt is said to be stockpiled on the property already, from previous potash operations.

United Heckathorn Inc. of Richmond, California, has started construction of its $200,000 artificial cryolite plant at Garfield, Utah. The plant had been under discussion earlier this year, but the decision for construction depended upon negotiation of a contract with *Western Phosphates Inc.* for purchase of fluorides. This arrangement has now been made permitting United to "strip" fluorine from Western Phosphates' phosphoric acid circuit. The firm will also buy fluorine from other sources, and encourages acid-grade fluorspar mine operators in the area to contact the company. Production goal is 1,600 to 1,800 tons annually.

The *Atomic Energy Commission* has released from withdrawal about 21,440 acres of public lands in the Elk Ridge area of San Juan County, Utah, and restored such land to location of unpatented mining claims. The lands were withdrawn in July 1953 as part of the AEC domestic uranium program. Under the order, 20,160 acres in the Manti-LaSal National Forest were opened on May 21, and the 1,280 acres outside the National Forest will be opened on August 20, 1958.

Homestake Hauls Uranium with Battery Shuttle Car

Homestake Mining Company is experimenting with a Kersey battery powered shuttle car for stope haulage at its North Alice uranium mine in Utah's Big Indian district. The 60-cubic-foot-capacity, end-dump unit has a width of 60 inches, a height of 49 inches, and an overall length of 138 inches. The unit is designed for maximum grades of 10° and has easily negotiated the 6 to 7° inclines driven in the ore bed at North Alice. Two Gould batteries give an operating range of 1,000 feet. Twelve ply 7.50 by 10 tires are used. The four-wheel drive has proved advantageous on the grades and wet clay bottom. Initially, the unit has been used for hauling from three faces down dip to a main level slushing pocket for loading into cars. One miner loads out a 45- to 50-ton round using an Eimco 630, electric-powered machine and the Kersey car. He operates the loader and drives the car to the pocket where the ore is dumped. After cleaning up the round, he starts drilling one of the other faces. The car is made by the Kersey Manufacturing Company, Blue Field, West Virginia.

Lands within the Forest already covered by mining claims located prior to withdrawal will not be open to location.

Vitro Uranium Company, division of *Vitro Corporation of America*, is planning to diversify its activities, and is currently seeking appropriate fields of endeavor. One possibility under consideration for the Salt Lake City, Utah uranium reduction plant is the use of additional circuits for beneficiation of other metals.

Bear Creek Mining Company has slowed down its exploration work in the Burgin shaft in the Tintic district of Utah to a one-shift-per-day operation. The generally depressed situation in the nonferrous metals industry is said to have been responsible for the decision to stretch out the time required to explore the area thoroughly. Bear Creek undertook the multimillion dollar exploration project in 1956. Participating firms are *Chief Consolidated Mining Company, Tintic Standard Mining Company, South Standard Mining Company, Eureka Standard Consolidated Mining Company*, and *Eureka Lilly Consolidated Mining Company*. The firm completed a 1,080-foot shaft, and is extending a westerly crosscut 2,000 feet. Extensive drilling has also been done both underground and from the surface. Several interesting areas of manganese have been found and there are indications of favorable ore deposition areas.

Kennecott Copper Corporation has been testing the leach-precipitation-flotation process for some time. Successful completion of the work has revealed that pyrite could be recovered from mill tailing at the *Utah Copper Division;* that the pyrite could be used in the production of sponge iron; and that sponge iron could be used instead of de-tinned scrap in precipitating copper from the mine dumps solution. This problem of dump leaching is extremely important because of the low-cost copper that is produced this way.

WYOMING

First shipments, totaling nine carloads, of uranium ore were made recently from Little Mountain, north of Lovell, Wyoming, by *Modern Mines Development Company* of Yakima, Washington. Production is from a 9 by 9, 740-foot inclined shaft which reaches a vertical depth of 165 feet. Drilling has indicated an ore body 100 feet wide, 260 feet long, and 13 feet thick. A front-end loader (TD9, International Drott) is used. The ore was shipped to the Riverton buying station. Eight men are working under Buford Miles of Helena, Montana, operational manager. The company is headed by L. V. Sigman of Yakima, and W. S. Doyle, also of Yakima, is secretary-treasurer.

Intermountain Chemical Company is testing the application of a commercial-scale continuous mining machine at its underground trona mine, about 20 miles west of Green River Wyoming. The unit was placed in service during April 1958. Test work on extraction of the 7- to 10-foot thick bed of trona ($Na_2HCO_3 \cdot NaHCO_3 \cdot H_2O$) using the continuous miner will continue for some time.

Lisbon Uranium, at last report, was shipping 600 tons of uranium ore from Little Mountain to the buying station at Riverton, Wyoming.

Shoni Uranium Corporation has started stockpiling ore at the *Bonanza* mine in the Copper Mountain mining area 43 miles from Riverton, Wyoming, and hopes to start shipments soon. The firm has decided to apply for a DMEA loan to explore the balance of the 48 claims in this property. The 50,000-foot drilling program on the firm's East Gas Hills property has just been completed. A subsidiary company, *Western Standard Uranium Inc.* is working in the Shirley Basin area where Shoni has 110 claims, and a contract-of-purchase on another 57 claims on Bald Mountain. These properties are semi-proven and production is scheduled for later this summer.

Ten uranium lode claims in the Gas Hills area of Wyoming have been sold to *Western Nuclear Corporation* by John E. Hudson and R. T. Brown, of Rawlins. Sale price was not revealed.

The character, processing and economics of central Wyoming phosphate rock is discussed in a bulletin published by the University of Wyoming's Natural Resources Research Institute. Written by H. G. Fisk director of the N.R.R.I., and Walter E. Duncan, chemical engineer, the bulletin reports on the study made of phosphate rock on the northeast flank of the Wind River Mountains. The character of the rock, liberation, gravity concentration, purification by calcination and slaking of contained limestone, defluorination by sintering, and economic studies are included. Free copies may be obtained by writing to the Institute at the University of Wyoming, Laramie.

The Wyoming Supreme Court ruled recently that discovery of the mineral is vital to claimstaking, not just the results of radiometric instruments. The decision involved firms in the Gas Hills which had seven of ten claims taken from them on the basis of geiger counter readings and "discovery pits" dug in the center of the claim area.

A new plant to supply Minnesota's taconite industry with bentonite is being built at Colony, Wyoming, about 20 miles northwest of Belle Fourche, South Dakota, by *Archer-Daniels-Midland Company* of Minneapolis, Minnesota. The mill is slated for completion of its 15,000 square feet steel structure shortly. Two concrete silos for storage will have a total capacity of about 1,000 tons of finished pulverized bentonite. The firm has about 25,000 acres of open-pit bentonite mining property in Wyoming. A stockpile of almost 150,000 tons of crude clay is at the plant site. The new plant will be a pushbutton operation, reports Warner B. Bishop, vice president of ADM. Drying and pulverizing the clay will be controlled from a central control room.

Wyoming's uranium ore reserves were revised by the AEC to be 9,200,000 tons at the end of 1957. This is 6,900,000 more than during the year 1957. The state now ranks second only to New Mexico in proven uranium ore reserves.

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Successful Method Found for Up-grading Autunite

Autunite type uranium ore from the Mount Spokane district, Spokane County, Washington has been successfully concentrated by froth flotation at the Washington State Institute of Technology's mining experiment station.

Low-grade ore containing 0.13 percent uranium oxide was upgraded to a 2 percent product with a 93.5 percent recovery. A 5 percent concentrate was made of the same low-grade but the recovery was only 85 percent. A high-grade sample containing 1.27 percent uranium oxide was concentrated to 11.2 percent with a recovery of 97.8 percent.

The Mount Spokane ore is of a granite type. Argillite type uranium ore from the Midnite mine in the Spokane Indian Reservation, containing autunite and other uranium minerals, did not respond so well to the flotation method.

Success came after 16 months of intensive research by William C. Aitkenhead, director of the experiment station, and John A. Jackel, metallurgist. They found an "excellent" collector in emulsions of stearic acid with hydrocarbon solvents. Reagent cost was on the basis of 60 cents per ton for upgrading the 0.13 percent ore.

The old *Apache* mine and mill west of Hailey, Blaine County, Idaho, has been put into production by *Silver Sun Mines* of Spokane, Washington. Lead-silver-zinc concentrate is being shipped to a Salt Lake Valley smelter. Paul H. Johnson is engineer in charge. Howard E. Johnson is president and general manager; Fred A. Winkler, secretary-treasurer.

The *Bunker Hill* Company, big lead-zinc-silver producer at Kellogg, Shosone County, Idaho, is operating at capacity the sulphuric acid plant which it put into production in 1954. Acid sales are running between 8,000 and 9,000 tons monthly. The firm's mining operations, however, are on a four-day week because of poor markets for base metals.

Silver Buckle Mining Company of Wallace, Idaho has acquired all assets of *Northwest Uranium Mines*, which was organized several years ago by Silver Buckle, *Eastern Lead*, and *Fortune* mining companies of Wallace, *Stansbury & Associates of* Spokane, and *Pathfinder Uranium Corporation* of Salt Lake City. Purchase consideration was $2,500,000 payable out of production from open-pit ore drilled by Northwest Uranuim in the Spokane Indian Reservation, Stevens County, Washington. Dr. F. E. Scott, Wallace, is president of both Silver Buckle and Northwest Uranium.

Sidney Mining Company has signed an operating agreement with *San Francisco Mining Company* on four claims in the Pine Creek District, Shoshone County, Idaho, home of the Sidney zinc-lead-silver mine. It also has taken a long-term-lease on the *Happy Day* mine, one-time gold producer, near Hailey, Blaine County. Sidney has failed to find ore on its new 2,300-foot level but downhole diamond drilling in the adjoining *Nevada-Stewart* property has disclosed mineralization which would be classified as ore when base metal prices improve. Malcolm C. Brown, Kellogg, is president.

The "09" vein, found at a depth of 3,400 feet in Shoshone County, Idaho's Silver Belt by *Sunshine Mining Company*, has been opened for a mineable length of 275 feet on the deeper 3,700 level and for 210 feet on the 4,000-foot level. The ore shoot averages 40 ounces of silver per ton. H. B. (Brad) Johnson is mine manager.

Circular steel sets are being used at the *Silver Mountain* project east of Mullan, Shoshone County, Idaho, because of very heavy ground. Two exploration laterals are being driven at a depth of 3,000 feet. One heading is an estimated 2,700 feet from the old *Snowstorm* copper-silver mine. *Hecla Mining Company* is doing the work under a joint venture agreement with the *Bunker Hill Company*. W. H. Love, Hecla manager of mines, is in charge.

At the *Conjecture* silver-lead mine near Lakeview in Idaho's Panhandle, *Federal Uranium Corporation* has completed a $150,000 exploration program and has started a development program to bring the mine into production. The present 700-foot exploration shaft will be superseded by a 1,000-foot, three-compartment operating shaft. A steel head-frame, reinforced concrete ore bins, crushing plant, and flotation mill are included in plans. Federal Uranium has become a 50-50 partner with *Conjecture Mines, Inc.*, of Spokane, which is headed by Donald E. Majer.

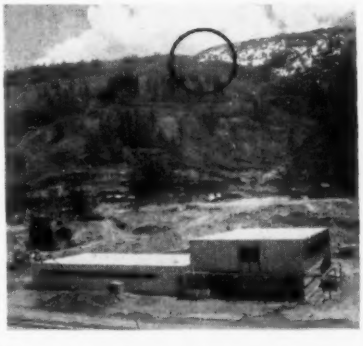
A 350,000-ton ore body suitable for low-cost open-pit mining has been outlined at the *Blackbird* cobalt mine of *Calera Mining Company, Howe Sound Company* subsidiary, at Cobalt, Idaho. E. B. Douglas is manager.

Whitedelf Mining and Development Company has been negotiating with a large mining firm to deepen the mine shaft into the favorable St. Regis host rock. The company suspended production of lead, zinc, and silver more than a year ago but lessees operated a portion of the mine until last August. Compton White Jr. of Clark Fork is president of the Bonner County, Idaho firm.

Coronado Copper and Zinc Company, subsidiary of *Cyprus Mines*, has closed its Wallace, Idaho exploration office along with other exploration field offices but plans to retain its *Cortez Silver-Lead* property east of Wallace in Shoshone County. S. K. Garrett was exploration engineer in charge of the Wallace office.

Peat moss fertilizer is being mined near Marsing, Idaho in the Weiser area by *Pivot Rock Mining Company* of Los Anamos, New Mexico. The large deposit was formed by vegetation decaying in a bog or lake bed and precipitation of minerals from hot springs. The material is being marketed in the Boise Valley.

$14,500,000 Phosphate Project Starts This Summer



Initial strip mining of phosphate rock at Central Farmers Fertilizer Cooperative's $14,500,000 project at Georgetown Canyon, 17 miles north of Montpelier, Idaho, is expected to get underway this summer. It is anticipated that about 350,000 tons of ore will be mined during the 1958 summer season. The ore will be stockpiled at the beneficiation plant now under construction which may go into limited production before the end of the year. Completed facilities, which will include an electric furnace for production of elemental phosphorus, phosphoric acid manufacture, and production of super phosphate, ultra-super phosphate, and perhaps ammonium phosphate, will not be ready until the spring of 1959.

The above photo shows the administration building and dry in the foreground. Just beyond the administration building, the steel work for the beneficiation plant can be seen at the base of the hill. Beneficiation will include washing, screening, and cyclone desliming of the ore. A partially completed Dorrco Fluosolids reactor can be seen at the down-hill edge of the steel work for the beneficiation plant. The reactor will calcine the ore, burning off the hydrocarbon content of deslimed feed. Reactor calcines will be ground, and a portion of the acidulation grade phosphate rock will be sold to the trade through the 14 farm organizations which Central Farmers Fertilizer represents.

In another plant, not yet under construction, furnace-grade phosphate rock from the mine will be nodulized, proportioned with coke and silica, and fed to an electric furnace to obtain elemental phosphorus. Elemental phosphorus and ground acidulation grade phosphate rock will form the feed for fertilizer manufacturing facilities.

A strip mine will be opened on the deposit which is located beyond the lower ridge included in the circle. The beds in the ore zone dip at a 70° angle in the direction of the slope of the topography at the mine site. The zone is about 180 feet wide but phosphatic shales in this zone are interbedded with waste. Within the 180-foot width, about 60 feet is composed of commercial phosphate beds with the remaining 120 feet consisting of interbedded waste. The hanging wall, composed of Rex chert, will have to be drilled and blasted. Material within the productive horizon can probably be handled by rippers. The overall waste to ore ratio will be 2.5 to 1. It is planned to mine the ore in 4 grades from 18 to 32 percent P_2O_5.

A 30-inch belt conveyor, approximately 4,000 feet long and consisting of 2 flights, will link the mine and the 350,000-ton stockpile area at the beneficiation plant. The slash line for the conveyor can be seen within the circled area of the photo. The haul to the conveyor loading installation at the mine end will never be longer than 4,000 feet.

Engineering and design work for the plant is being handled by F. C. Torkelson Company of Salt Lake City. The prime construction contractor is Jacobsen Construction Company. Charles M. Miller is director of manufacturing for Central Farmers Fertilizer, and Don Anderson is mine superintendent.

James H. Wearin is president and John Glass, company geologist.

Charging that the *United States Forest Service* and its road builders covered up minerals on his mining claim and did other damage, Robert W. Mullen, Clearwater County, Idaho mine operator, has sued the government for $29,879. He also claimed the defendants made operations difficult for him by dumping rock and dirt into a creek on his claim and that the road constructor took 3,500 cubic yards of ore-bearing minerals from the claim for use on a road.

Wallace Kinnunen of Orofino, Idaho, and Lester Darrar of Calder, Idaho, have been granted quartz leases in Shoshone County by the *Idaho State Land Board*. A. Musser of Orofino was granted a placer lease in the same county.

Callahan Mining Corporation (formerly *Callahan Zinc-Lead Company*) again is owner of the *Galena* mine in the Coeur d'Alene district of Shoshone County, Idaho. Some years ago it turned the property over to a newly formed subsidiary, *Vulcan Silver-Lead Company*. The parent firm recently absorbed Vulcan in a merger and changed its own name. The mine is being operated under long-term lease by *American Smelting and Refining Company*.

The *Bunker Hill Company's* mine at Kellogg, Idaho produced more metal in 1957 than in 1956 and development work was very successful during last year in placing more tons in reserve than were mined during the year. Bunker Hill ore reserves were at an all-time high.

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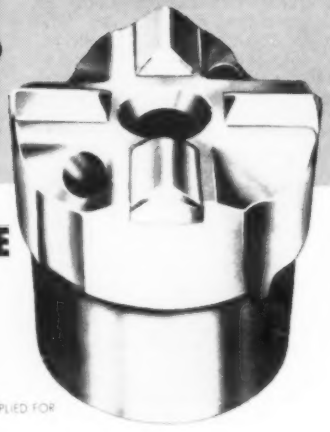

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Kootenai Mines, Inc. has been incorporated by three Coeur d'Alene, Idaho men—Elmer Erickson, W. F. McNaughton, and H. S. Sanderson. The firm was capitalized at $250,000.

Caledonia Silver-Lead Mining Company has transferred four patented mining claims and its underground rights beneath Wardner, Shoshone County, Idaho, to *Yreka United, Inc.* for 400,000 shares of Yreka stock. Yreka is negotiating for deep development work by the *Bunker Hill Company*.

MONTANA

National Lead Company is mining two barite deposits in Missoula County, Montana. Ore from a vein discovered by William Dittrich of Coloma one mile from town in 1955 is trucked to National Lead's mill on the Big Blackfoot River near Greenough. The vein is mined by open-cut methods. A miner drills 16 holes in the face with a wagon drill and a mucker loads the barite by means of a 1½-yard caterpillar-mounted front end loader. The vein has been mined over a length of 250 feet and averages 12 to 15 feet wide. National Lead recently purchased a barite vein on Elk Creek from *F & S. Mining Company* of Butte. The vein is mined by conventional underground methods.

A new lower crosscut tunnel is planned at the *Little Joe* uranium prospect on the west fork of the Bitterroot River, Ravalli County, Montana by *National Uranium Corporaion* of Wallace, Idaho. Work is to start as soon as an easterly drift in the upper tunnel is extended some 40 feet along a phyllite vein to get beneath a surface ore outcrop. John T. Kingsbury is president and general manager.

An office building is under construction at the uranium prospect of *Western Resources, Inc.*, near Saltese, Mineral County, Montana. Drilling of surface showing of autunite uncovered by bulldozing last year is planned. Western Resources recently took over assets of *Indian Chief Uranium Company* and *Antelope Uranium Oil Company* through merger. All are Spokane firms. Indian Chief held a lease and purchase option on the *Waterhole* group under development near Saltese. Allen R. Campbell of Spokane is president.

Anaconda Company is producing 26,000 tons of ore per day from its *Berkeley* pit near Butte, Montana instead of the 17,500 tons originally planned. This is being done in order to obtain the same amount of ore in a five-day week instead of six. Equipment is being moved to the Ryan shaft site but no plans have been announced.

Lee and Ward have started placer mining near Jefferson City, Montana. The company has rehabilitated a bucket-line dredge formerly owned by the *Winston Brothers*, and it is now washing gravel.

Anaconda Aluminum Company reports it has set a new national safety record for aluminum reduction plants. The plant's 600 workers completed 1,196,536 hours of work without a lost-time accident.

The char plant at Red Lodge, Montana, closed earlier this year, has been returned to production of industrial car-

bon and byproducts. The operator is *Husky Oil Company*, which has taken a 12-month option to buy the plant for $450,000. The plant was constructed by *Koal Krudes, Inc.* of Spokane, Washington. Coal mined in the Deer Lodge area is used in the plant. M. R. McArthur of Cody, Wyoming is executive vice president of the oil firm.

Montana Coeur d'Alene Star Group Syndicate, with lead-silver claims in Sanders County, Montana, has been merged with *Nevada Rawhide Mining Company* of Cheney, Washington. Clarence Davis is president of the Washington firm.

Umont Mining Company has suspended operations at the *Norwich* mine, located two miles west of Butte, Montana. The shutdown was prompted by the impending curtailment of the government's manganese purchase program. Many other operators of small mines in this area are also closing down their operations.

A new mining and smelting firm has been incorporated in Montana, with headquarters at Bozeman. The firm is *Lee and Ward*, directed by Harold E. Heiser, Paul R. Lee, Virgil E. Ward, and Clyde Bradley, all of Bozeman.

OREGON

Lakeview Mining Company is constructing an office and change house and grading for construction of its $2,600,00 uranium processing plant north of Lakeview, Lake County, Oregon. An 11-mile power line is being built to the firm's *White King* uranium mine by *California Oregon Power Company*. Miners have sunk 312 feet and are driving mining openings at the 250-foot level. Other levels already have been established at the 70 and 160-foot points. Burr Johnson is mill construction superintendent and James F. Poulos, company manager.

Harvey Aluminum Company is testing pneumatic unloading equipment at its new reduction plant at The Dalles, Oregon, on the Columbia River. The test was made with 200 tons of sacked alumina from Japan.

Cordero Mining Company at Ashwood, Oregon has suspended all mining and milling operations at the *Horse Heaven* mercury mine. Total production from the mine amounted to about 17,000 flasks.

The old *Bay Horse* silver mine on the Snake River near Huntington, Baker County, Oregon is being reconditioned and reopened by Bill Traver of Davenport, Washington and Henry and Harold Franz of Ritzville, Washington. Diamond drilling is planned to evaluate the mine.

The *Oregon* chrome mine in Josephine County, Oregon has been closed because of the end of the government's stockpile purchase program. The mine has produced intermittently since World War I. During the last period of production, 1952 to date, the mine produced 12,000 tons of metallurgical grade chromite.

A gold nugget weighing 14 ounces, nine pennyweight, and worth about $400, has been found by prospector Bill Horn in the famed old Althouse Creek mining area near Cave Junction, Oregon.

The *U. S. Bureau of Mines* has examined 39 manganese deposits in south-

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In a recent uranium operation at McKinley County, New Mexico, this equipment was used successfully in the Westwater formation, a soft, unconsolidated sandstone, where previously, high core recovery was very difficult, and many times impossible. The operator reports that this equipment recovered *over twice the core* (up to 98%) that had previously been recovered by conventional equipment. In addition to New Mexico, superior results have been obtained in soft iron ore formations in Southern Utah and Northern Minnesota with a slightly smaller barrel and bit. Excellent results have also been obtained in the Wind River formation of the Gas Hills area in Wyoming.

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western Oregon and describes them as small and irregular. The deposits average less than 20 percent manganese and contain 25 to 50 percent silica. The Bureau has demonstrated at its *Northwest Electrodevelopment Laboratory* at Albany that these ores can be smeltered in an electric furnace to make silicomanganese, or an acceptable pig iron.

An exploration program is under way in the Mount Spokane District by a new firm, *Spokane Mountain Uranium Company*. It is exploring the *H. C. Ingram* lease 2 miles southeast of the producing *Daybreak* mine. Albert R. Perri of Lewiston, Idaho, is president, and Harry T. Phillips, of Lewiston, secretary and treasurer.

Highnoon Uranium Mines, Inc. has made its initial shipments of uranium ore to the Ford, Washington processing plant from its *Lost Creek* mine in northern Pend Oreille County, Washington. C. N. McJunkin of Hermiston, Oregon is president. Two other firms also are active in this area—the *Triple H. J.* and the *Circle Seven*.

Dawn Mining Company, operator of the Ford, Washington uranium processing plant, has started accepting custom shipments at low as 350 tons. The minimum formerly was 500 tons. Milling continues at capacity of 440 tons of ore daily. *Isbell Construction Company* is producing 1,000 tons of ore daily from open-pitting at Dawn's *Midnite* mine in the Spokan Indian Reservation, southwestern Stevens County. Jack Crowhurst is Dawn manager.

Daybreak Uranium, Inc. has tunneled about 100 feet since starting underground mining operations at its open-pit autunite mine in the Mount Spokane District, northern Spokane County, Washington. Ventilation equipment has been installed and washing equipment put on a tractor used underground. One thousand tons of development ore were shipped recently.

Gold-silver ore reserves in the Gold Dollar ore body near Republic, Ferry County, Washington, were tripled in tonnage and grade in 1957 with opening of the 9th and 10 levels. On each new level, ore widths and values were substantially greater than on levels above. The ore body, owned by *Day Mines, Inc.* of Wallace, Idaho, is being mined under lease by *Knob Hill Mines, Inc.* from its adjoining workings.

Circle Seven Mines, Inc. of Ione, Pend Oreille County, Washington, has been incorporated to carry on uranium operations in the nearby Lost Creek area. Directors are Glenn Hersey of Ione; Verne P. Sauer of Spirit Lake; Milton R. Sharp, Virgil Sauer, and C. N. McJunkin of Usk; Roger B. Humberger of Pullman, and R. L. Ekleberry of Hermiston, Oregon.

Development of lower levels of the *Grandview* mine near Metaline Falls, Pend Oreille County, Washington, has indicated a larger tonnage of better grade lead-zinc ore than anticipated. Production has been at a rate of about 1,200 tons of zinc-lead concentrates monthly. *American Zinc, Lead and Smelting Company* is operating the property under a purchase agreement with *Grandview Mines* of Spokane.

Hematite iron ore is being mined by open-pitting at the old *Kulzer* underground iron mine east of Valley, Stevens County, Washington, by C. C. Hill of Spokane, who sells it to *Ideal Cement Company's* Spokane Valley plant. Troy Hood of Spokane has a contract to strip and stockpile 5,000 tons. Mr. Hill also is mining clay by power shovel south of Vera, Spokane Valley, and selling it to the cement firm.

Skookum Uranium, Inc. has made a public stock offering to raise $100,000 for exploration of its holdings at Usk, Pend Oreille County, Washington. T. A. Tester of Spokane, is president.

Fred J. Menke of Govan, Washington is planning to explore three mining claims in the Orient mining district of northern Stevens County.

Pacific Northwest Alloys, Inc. recently shut down its Mead plant, near Spokane, Washington, for an indefinite period because of excessive stockpiles of ferrochrome, brought about by a dirth of orders from the steel industry. From 300 to 400 men are employed when markets are good for ferroalloys. Ralph Ebersole is plant manager.

Exploration work at the long-idle *Flaghill* property in the Republic gold district of Ferry County, Washington, is planned by *Flaghill Mines, Inc.* An air compressor and trammer have been purchased. Percy L. Bergt of Moses Lake is president and manager of the Olympia firm.

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Chemical Ore Processing Topic of Western Seminar

Chemical processing of ores will be of growing importance as ore grades decline, desired values are more finely dispersed, and mineral groups become more complex, reported Leslie A. McClaine of the San Francisco, California office of Arthur D. Little, Inc. at a Seminar on Technology of Western Minerals.

He reported that in today's metallurgy a chemical scientist has been added to the mining engineer-metallurgical engineer team to evaluate and solve mineral problems. A further search for methods to utilize the existing biological systems which concentrate metals is needed, he said; for example, a high separation factor with selectivity is achieved by the oyster which concentrates copper, by lobsters and mussels which extract huge quantities of cobalt, and by various mollusks which utilize nickel.

Research and development opportunities are widespread in mining and beneficiation, reported W. I. Watson of the Little staff. He speculated on the possibilities of smelting entire ore bodies in place, removal of overburden by shock waves, block caving with ultrasonics, the selective shattering of specific materials with ultrasonics, and the volatilization of minerals in place and their recovery from the gaseous phase.

Shipments of uranium ore now are being made from the Monument Valley District in Arizona by lessees *Sidney Mining Company*, *Mascot Mines*, and Inar Norgaard, all of Kellogg, Idaho. Production is coming from a 210-foot shaft sunk by the joint venture to reach an ore body drilled out by a large oil company.

Production for the three-month period ended April 30, totaled 3,072 tons of uranium ore from the *Orphan* mine in the Grand Canyon of Arizona, operated by the *Western Gold & Uranium Inc.* The ore averaged more than 0.95 percent U_3O_8. Work is well underway on sinking of the 1,500-foot shaft which will increase the production rate from 1,000 to 5,000 tons per month. The $800,000 project is to be completed early in 1959.

Kennecott Copper Corporation's new Hayden smelter is scheduled for test runs shortly. The new filter plant adjacent to the smelter has been in operation since April 15 and has been handling plant production of concentrates satisfactorily. The concentrates are being stored until the smelter is ready.

Mining exploration activities during the first quarter of this year have led *Sunshine Mining Company* to abandon the *Big Bear* copper prospect in Cochise County, Arizona. A program of churn drilling and geological mapping failed to justify an open pit operation or sufficient grade to permit underground mining.

Miami Copper Company, Miami, Arizona, has announced plans to close its Arizona mines for four weeks in July for vacations, rather than operate the properties under the staggered vacation schedules of former years. The new plan, it is reported, will reduce 1958 production of copper by about 2,200 tons. Previous curtailments, starting in April of 1957, have already cut Miami's production by about one-third. Copper produced in 1957 totaled 87,379,592 pounds, compared with 99,523,002 pounds in 1956, the 1957 production being divided as follows: *Copper Cities Division*, 41,492,801 pounds; *Miami Copper Division*, 40,896,046 pounds; and the *Castle Dome Division*, 4,990,745 pounds, recovered by water leaching of the old mine dumps. Current estimates indicate a 1958 production of approximately 61,000,000 pounds. The ore mined at the Copper Cities division averaged 0.714 percent copper, in 1957, while that from the Miami Copper Division assayed 0.704 percent copper.

On June 1, *Phelps Dodge Corporation* made an additional 20 percent cut in production at its Arizona mining operations. The new schedules at the *Morenci*, *Ajo*, and *Lavender* pits, and the concentrator at Bisbee, will be eight days of operation followed by a six-day shutdown in each two-week period. The schedule in effect at these properties since January 1958 has been 10 days of operation, followed by a four-day shutdown. The working schedule for the *Copper Queen Branch* underground mines at Bisbee was cut from five days a week to four. According to W. C. Lawson, vice-president and general manager, the reduced work schedule will not result in any layoffs at the plants involved. Present plans call for summer shutdowns for vacations for a three-week period, instead of the two weeks in previous years. The current cutback is the fifth which Phelps Dodge has put into effect since October of 1956. Cumulative reductions over the year and one-half are estimated roughly at 8,600 tons a month, or nearly 40 percent below the 1956 rate of output.

A crew of 14 to 16 men is employed at the *Apache* mine by *Metate Asbestos Corporation*, Globe, Arizona, and production is maintained at the maximum rate permitted by mill capacity. The ore is hand cobbed to remove the obviously low-fiber serpentine, and the "waste" is stockpiled for processing at a later date. The cobbed fiber is then broken out in a crusher and sent to the screening plant, where a succession of shaking screens separates the main grades. Grades No. 1 and 2 are delivered to the government stockpile at Globe; Grades Nos. 3 to 5 are stockpiled at the new mill site, east of Globe; and Grades Nos. 6 and 7 are stockpiled at the mine. The company estimated that about 6,000 tons of Nos. 3-7 are stockpiled, and that about 10,000 tons of sub-No. 7 are available. Jack Neal is president of Metate Asbestos.

Some exploration work on an intermittent basis is being conducted by lessees at the *Cora* mine in the Tombstone district of Cochise County, Arizona. The property, owned by E. H. Festerling of Bisbee, is under lease to Alejo Antunez of Tombstone, and associates. They are sinking a winze, working about 10 to 12 shifts a month.

Bagdad Copper Corporation, Bagdad, Arizona, reports that during 1957 copper production amounted to 19,626,415 pounds, with a net loss of $399,908.06. The red figure for the year, according to J. C. Lincoln, president, is due largely to a charge of nearly $2,000,000 for stripping during the year and the low price of copper. A substantial portion of the stripping charge, he said, is actually an asset which will be available for the future. By the middle of this year, Bagdad expects to have uncovered a three-year supply of ore at a rate of 5,000 tons per day of ore through the mill. Exploratory drilling is continuing in the vicinity of the *Daisy* mine. Results so far have indicated a large open-pit copper ore deposit.

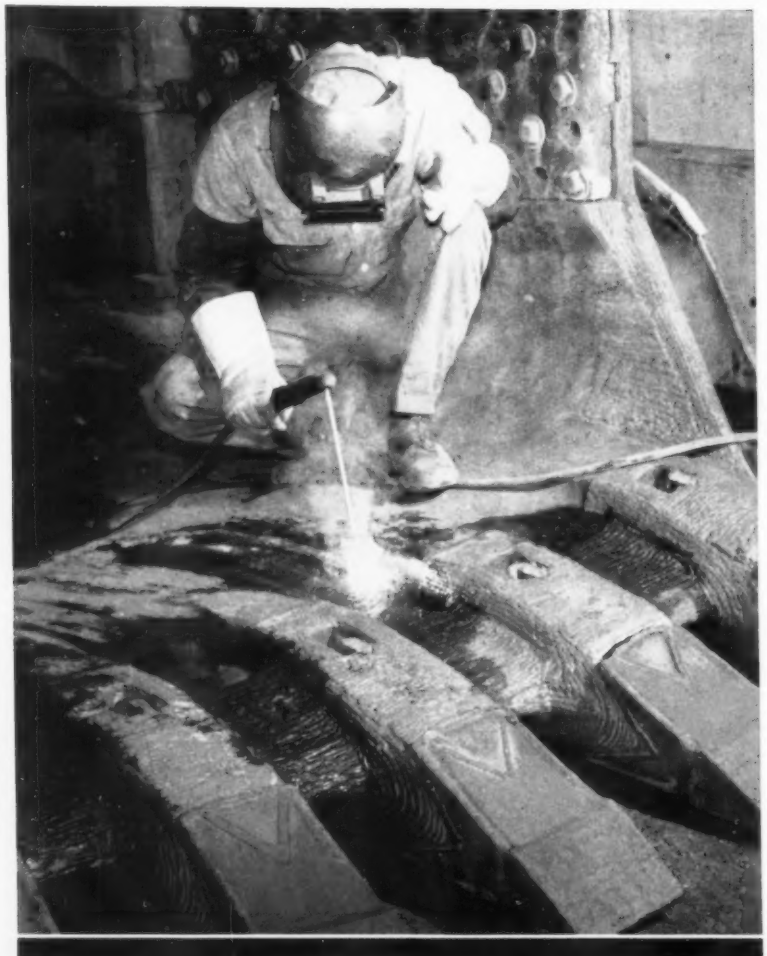
The *Sunrise Mining Company* is shipping about 600 tons of lead ore monthly from its *Glove* mine in the Tyndall mining district, Santa Cruz County, Arizona. The ore is trucked to Amado, a distance of eight miles, then sent by rail to the *American Smelting and Refining Company's* El Paso smelter. Current production is obtained by stoping on and above the 240-foot level. Recent exploration and development work has consisted of sinking a 66-foot winze below the 240-foot level and drifting on the 300-foot level. This winze, according to present plans, is to serve as the lower section of a new vertical shaft from the 300 level to the surface. G. W. Irvin of Sahuarita, Arizona, is general manager of mining operations. A crew of 16 men is employed on a one-shift basis.

Mining of sericite has been started nine miles west of Tombstone, Arizona by the *James Stewart Company*, large contracting firm with diversified interests. The firm has spent nearly a year converting an underground lead and zinc mine into an open-pit operation and building a mill. In the past, when lead and zinc were mined, the sericite was thrown away; now lead and zinc will be byproducts of the sericite. C. A. Cosgrove, vice president of the Stewart company, reports that the property is being purchased from *Charleston Mines Inc.* headed by Charles H. Suiter, Sr. of Tombstone.

Fairview Placers, Inc. has agreed to accept $350,500 from the U. S. Bureau of Reclamation for its fee holdings and leases in the Trinity Dam reservoir area in northern California and for agreeing to abandon its gold dredging operations there. The company has until January 1, 1964, to remove its dredge and salvage its camp and other facilities. A total of 17,000,000 cubic yards of gravel has been dredged by the firm which is a subsidiary of *Sunshine Mining Company* of Spokane, Wash. (95 percent) and *Idaho Canadian Dredging Company*.

Milton L. Kane of Los Angeles, California reports he has a high-grade boron deposit on property in Ventura County, California. He hold 3,000 acres and a U.S. Forest Service permit for sodium borate.

The *United States Geological Survey* has placed in open file the report entitled, "Core logs from five holes near Kramer, in the Mojave Desert, California," by W. K. Benda, R. C. Erd, and W. C. Smith. The report may be consulted at the Geological Survey offices in Menlo Park, Sacramento, Los Angeles, and Claremont, California, Denver, Colorado, and the Office of the Chief of the California Division of Mines in San Francisco. The actual cores described in the



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report may be inspected at the USGS laboratory in Claremont. These test drill holes were made as part of a survey of the Mojave Desert's mineral resources.

Duke City Enterprises Inc. is operating a gold-bearing placer property in the Mojave Desert near Hesperia, California. The 480 acres were first located by George Hedrick and associates. Recovery is averaging about $1.35 per yard.

Natomas Company worked most of last year with three dredges in operation in the Folsom district of California. A fourth dredge had shut down in March 1957 after exhaustion of available reserves. Two other boats dredged marginal areas during several months of the year. These factors resulted in an average monthly reduction of 27.7 percent in total yardage handled and 30.0 percent in gross gold produced, as compared with similar averages for the 15-month period ended December 31, 1956. In 1957 the firm dredged 13,435,762 cubic yards compared with 23,278,469 cubic yards in the 15-month period ended December 13, 1956. Net returns per yard showed 0.23¢ for 1957, and 1.42¢ for the 15-month period ended in 1956.

Yuba Consolidated Industries Inc. of San Francisco, California has established a fellowship program at *Stanford University* for the study of heat transfer in relation to power generation from nuclear fission, with its ramifications in the chemical and petroleum fields. The firm has allocated $4,500 annually for three years to be awarded to a graduate student on a year-round basis in heat transfer fields that are of interest to both the University and Yuba Consolidated. Yuba recently established a Research and Development Center at Benecia, California to conduct research in these fields.

NEVADA

Metals Exploration Corporation is planning to increase the capacity of its 20-ton rotary furnace to 30 tons daily at its quicksilver operation in Dry Gulch near Lovelock, Nevada. Mining is being done on three levels at 5,500, 5,521 and 5,550-foot elevations. The ore is reached through a 400-foot main adit.

Milling operations have started at *Round Mountain Gold Dredging Corporation's* placer deposits at Round Mountain, Nevada, which the firm holds on a 15-year lease. Initial treatment in the mill has been for about 7,500 yards per day; the goal is 10,000 yards or more daily. Over 2,000,000 yards of overburden have been removed and stripping operations are continuing.

The *White Caps Gold Mining Company*, operating the old *White Caps* mine at Manhattan, Nevada, has made arrangements with a large New York investment firm for the reopening of the mine at depth, and moving and installation of a 150-ton gold mill to the mine. The mine has been unwatered to the 800-foot level and with the recent installation of a new Fairbanks & Morse electric motor is now being unwatered to the 1,220-foot level.

Sandstorm Mining Company has abandoned the uranium lease which was operated under a joint venture with the

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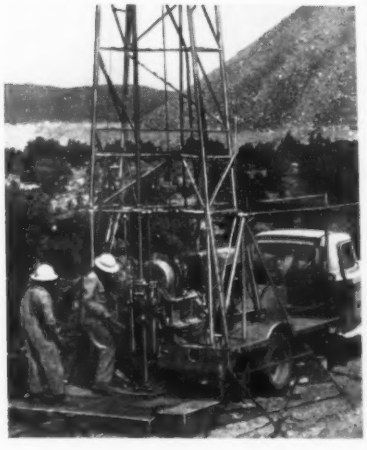

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SOUTHWEST

Red Hill Uranium Company in the Belmont mining district near Tonopah, Nevada. The firm has now acquired an undivided 25 percent interest in four separate 640-acre lease applications in California, subject to approval by the Bureau of Land Management.

Consolidated Copperminer Corporation plans to continue operation of its western exploration and prospecting office despite the fact that it has removed itself from the active mining business through sale of its Nevada properties to *Kennecott Copper Corporation*. The firm is taking this action "in order to evaluate new situations as they may from time to time be developed."

NEW MEXICO

The new $500,000 *Dow Chemical Company* terminal six miles west of Grants, New Mexico is in operation under the direction of the chemicals division of the Whitfield Truck Lines Inc. Two large steel silos hold 500 tons of powdered soda ash used in the acid leach process of uranium milling, and another can hold 31,000 gallons of caustic.

E. P. Moe is reported to have started a uranium operation at the *Gassett* mine in Sec. 18, T. 13 N., R. 9 W in the Poison Canyon district of McKinley County, New Mexico. The mine will be opened by a 500-foot incline dipping 20 degrees. Also opening up a new uranium operation is the *W. C. T. Engineer Company* which is developing a small open pit known as the *Becenti* mine. The project is located on Indian alloted land 15 miles east of Gallup in McKinley County.

The old *Bluebird* mica mine has been reopened by Onofre Valdez in Arriba County, New Mexico.

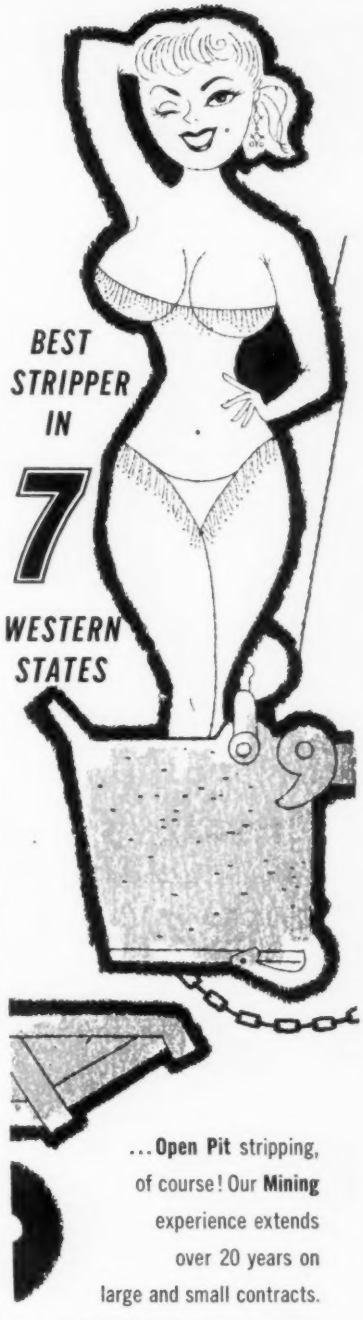
The *Concho Bluff Oil Company* has started a new open-pit manganese mining operation in Socorro County, New Mexico. W. L. Golding is in charge of the operation and James R. Person is general manager.

Shiprock Industries Inc. a subsidiary of *Petro-Atlas Corporation*, is driving a 1,500-foot tunnel on Navajo Reservation property formerly operated by *Southpeak Mining Company* near Shiprock, New Mexico. The lease, formerly held by Roland Young, Stanley Fowler, and Ermun Delpaz, has been a source of considerable low-grade uranium ore. Shanon A. Fowler of Albuquerque is general manager of operations.

Dakota Mining Company is reactivating the *Pat No. 2* mine in Sec. 4, T. 13 W., R. 10 N., in McKinley County, New Mexico, as a small underground uranium operation.

Empire Zinc Division of *New Jersey Zinc Company* has closed its mine at Hanover, New Mexico because of depressed condition of the zinc industry.

The *Chino Mines Division* of *Kennecott Copper Corporation* plans to spend nearly $1,000,000 during 1958 on new plant and equipment. Expenditures include nearly $500,000 for a new warehouse at Hurley, New Mexico, which will double present warehouse capacity; a new rotary drill; a mobile drill; a new bulldozer; and major replacement



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parts for three power shovels. Meanwhile, the division has gone on a four-day work week to bring about a 20 percent reduction in copper output at Chino, and has closed its fire refinery because of a declining demand for fire refined copper. All of Chino's copper production will now be in the form of blister copper which will be sent to an electrolytic refinery for further processing.

Great Lakes Carbon Corporation is almost ready to start perlite production from its new El Grande plant at No Agua, New Mexico. The new plant is designed to produce crude perlite at the rate of 30 tons per hour. The main portion of the plant, including all crushing and screening facilities, is located at the *Nu-Alexite* mine site. Storage and shipping facilities are located at the railhead 25 miles north.

U. S. Judge Waldo Rogers denied motions to dismiss a suit over control of the fabulous *Jackpile* uranium mine in western Valencia County, New Mexico. The Alonzos, a family of Laguna Indians, who claim title to the property on which the mine is located, asked dismissal of the government's suit to quiet title to the lands. Judge Rogers also turned down a motion to dismiss a complaint filed by the *Anaconda Company* which operates the mine. In addition, the judge denied motions to strike certain portions of both complaints! The Alonzos were given 20 days in which to file an answer suit to the government's suit and Anaconda's cross-claim, and 30 days in which to answer questions propounded by Anaconda. The government is trying to quiet title on behalf of Laguna Pueblo, on whose land the mine is located. The title in question involves about 50,000 acres known as the *Paguate Purchase* in the northern part of the Laguna reservation. Rogers last year ordered the Alonzos to discontinue a $31,000,000 damage suit in Valencia County against Anaconda!

The first labor contract for mining uranium ores in New Mexico's Ambrosia Lake area was signed by officials of *Rio De Oro Uranium Mines Inc.* and Local #16 International Hod Carriers, Building and Common Laborers Union. The contract covering approximately 60 Rio De Oro employees for a year calls for a minimum hourly wage of $1.90 to $2.30 with paid holidays, vacations, health, and accident insurance.

The 1958 convention of the *New Mexico Mining Association* is to be held in Carlsbad, New Mexico October 30, 31 and November 1.

TEXAS

The *General Services Administration* is calling for bids on the huge manganese stockpile at El Paso International Airport in Texas. The stockpile is in the way of a planned freeway development.

Texas Gulf Sulphur Company's $5,000,000 Fannett Dome sulphur plant has gone into operation 13 miles east of Beaumont, Texas. The plant, seventh producing unit to open in the state, is operating at one-third capacity and will continue to do so until the sulphur market improves. It is presently producing between 300 and 500 tons of sulphur a day. Most of the output will be shipped to customers in a molten state from special facilities recently put into operation at the firm's nearby Spindletop plant. Like other Gulf Coast plants, the new unit will utilize the Frasch process.

Strategic Minerals Corporation of America has applied to the SEC to sell bonds and common stock to finance processing plants at Texarkana and Wenden, Arizona. The company, which has offices in Dallas, Texas, acquired all the mineral leases and properties of the *Mena Mining Corporation* of Mena, Arkansas, after it was organized in 1955.

Columbia Southern Chemical Corporation, a subsidiary of the *Pittsburgh Glass Company*, has applied to the *U.S. Atomic Energy Commission* for a permit to build and operate a uranium processing plant in Duval County, Texas.

The *Federal Trade Commission* invoked new antitrust powers for the first time against *Dresser Industries Inc.* of Dallas, Texas, *Magnet Cove Barium Corporation* of Houston and *National Lead Company* of New York. The federal agency, invoking authority written into the Clayton Antitrust Act in 1950, accused the three firms of attempting to monopolize barite production by absorbing competitors. The FTC specifically objected to Magnet Cove's acquisition in late 1955 of *Canadian Industrial Minerals Ltd.*, of Toronto, and to similar moves by the other two firms.

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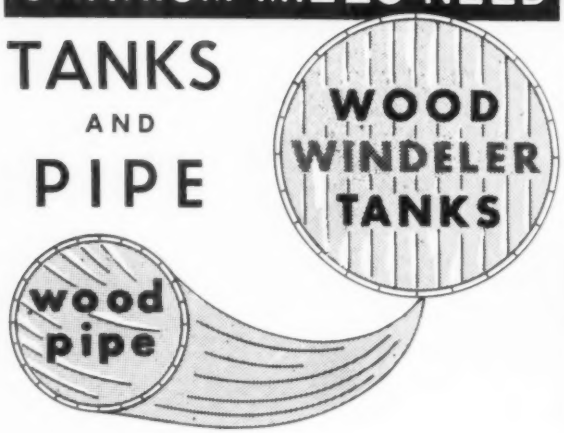

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September 15 to 25. INTERNATIONAL CONFERENCE ON MINE CONSTRUCTION, Warsaw, Poland.

September 17, 18, and 19. The ROCKY MOUNTAIN MINERALS CONFERENCE, AIME, Newhouse Hotel, Salt Lake City, Utah.

September 22 through 26. American Mining Congress, MACHINERY EXPOSITION AND CONVENTION, Brooks Hall, San Francisco, California.

October 20 to 23. The Seventh NATIONAL CLAY CONFERENCE, National Museum in the Natural History Building of the Smithsonian Institute, Washington, D. C.

October 23, 24, and 25. Society of Mining Engineers, AIME, MID-AMERICA MINERALS CONFERENCE, Chase-Park and Plaza Hotels, St. Louis, Missouri.

October 30, 31 and November 1. Annual convention of the NEW MEXICO MINING ASSOCIATION, Carlsbad, New Mexico.

November 6, 7, 8. Annual Meeting GEOLOGICAL SOCIETY OF AMERICA, St. Louis, Missouri.

Quebec Cartier Invites Bids for 200-Mile Railway

Quebec Cartier Mining Company, a wholly owned subsidiary of United States Steel Corporation, has issued an invitation for bids to construct a 193-mile railroad from the company's mining claims at Lac Jeannine to Port Cartier, Canada, near Shelter Bay. Also included in the current construction project is a 60,000-horsepower hydroelectric plant to be built on the Hart-Jaune River a few miles south of the company's main mining area. The railroad will be built alongside a 200-mile access road to Port Cartier which was recently completed.

Construction of a deep-draft harbor and loading facilities at Port Cartier and preparation of a large open-pit mine and concentrator for the production of high-grade iron ore concentrates are planned in the future. In addition, these installations will require the founding of two new towns to accommodate a combined population of about 5,000 people. Estimated cost of the entire project is between $200,000,000 and $300,000,000, of which approximately $120,000,000 will represent the railroad.

Exploration of the area, which began in 1952 has covered more than 20,000 square miles in Saguenay County. More than 100,000 feet of diamond drilling has been done in an area 70 miles long, known as the Mount Reed-Mount Wright region, which is about 150 to 200 miles north of Shelter Bay. Major deposits of low-grade crude ore averaging about 30 percent iron (requiring beneficiation) have been found. Although no official reports concerning tonnage or grade of ore in the Lac Jeannine deposit have been released, it is now planned to construct a 8,000,000-ton-per-year concentration mill near the mine.

Quebec Cartier expects to market its ore in Europe and the United States, as well as Canada.

New Process, Revised Law Improve Suriago Prospects

Development of a new process of treating complex nickel ore may pave the way for exploitation of the government-owned nickeliferous iron deposits on the Suriago Mineral Reservation in Mindanao, The Philippines. Although the project has been open to bids from private mining companies for a number of years, there has been little response because development of the deposit appeared unprofitable. Present treatment of the laterite ore enables the operator to make money mainly on nickel. The new process, which has been successfully tested by the U. S. Bureau of Mines at Albany, Oregon, separates nickel from the iron, cobalt, and chrome so that the latter metals will also be of commercial value.

Another important factor in increasing interest in the deposit is a proposed revision in the terms of bidding. Included in the recommendations now before the Philippine Congress are: reduction of the government participation in the net profit from 50 to 35 percent; reduction in the government participation in the gross profit from 5 to 3 percent; allowing the operator to deduct from his income tax to his government the amount of income tax paid to the Philippine government; giving the operator the option to continue operating the property under contract even after the 50 years permitted in the contract; and allowing other than United States investors to enter into the bidding and to participate to the extent of 40 percent of the total capital. These revisions are intended to interest foreign industries, especially large mining companies with the knowledge and capital to invest in such a large project. It is reported that Benguet Consolidated, Inc. has expressed a desire to bid if the revised terms are passed, as well as several foreign nickel producers.

The deposit, containing an estimated 29,000,000 metric tons of ferruginous laterite and serpentine with 1.38 percent nickel, is now valued at approximately 10,000,000,000 pesos according to Benjamin Gozon, director of the Philippine Bureau of Mines.

LATIN AMERICA

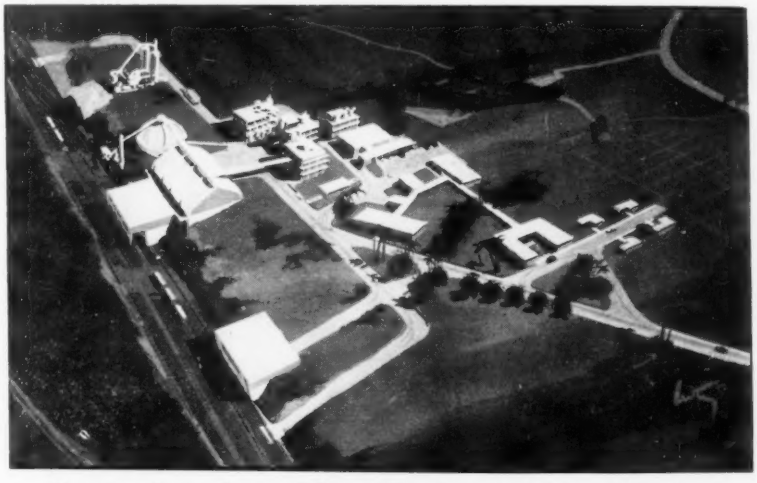
ARGENTINA—*Corporacion Nord-Patagonica* is planning to develop the *Sierra Grande* iron ore deposit with the cooperation of United States investors. (See MINING WORLD, April 1958, pp 49-51, 81, for a description of this promising new mining district.) It is expected that a credit of some 350,000,000 pesos will be necessary to fulfill the plans. Sierra Grande is located in the Province of Rio Negro, about 80 kilometers from Puerto Lobos on the Atlantic Coast, midway between the *Rio Turbio* coal deposits and Buenos Aires. More than 100,000,000 tons of 55 percent iron ore have been developed in the deposit already.

BOLIVIA—*South American Gold and Platinum Company* has purchased one of the idle dredges of *Bulolo Gold Dredging Ltd.* and is now moving the dismantled equipment to eastern Bolivia for work there.

MEXICO—Roberto Ancira is developing a gold mine near the *Bastan* copper mine in the state of Guerrero. Metallurgical tests have been carried out by cyanidation with a very high recovery. At first, treatment will be made by percolation leaching. Meanwhile, development work is continuing in the mine where Mr. Ancira has been exploring the property for the past three years. The ore averages 46 grams of gold and 104 grams of silver per ton.

ARGENTINA—Samples of *Farellon Negro* ore have been tested in Santiago de Chile by Wilbert Warnke, United Nations technician, in order to recover manganese by flotation. Pilot plant tests are being carried on in the installations of the University of Tucuman at Agua Tapada, near the mine. Farellon Negro gold-silver-manganese mine is located in the province of Catamarca and was developed by the University. It has not yet been decided whether the mine will be operated by the University or a private concern. Sampled ore averages 12 grams gold per ton and some 20 percent manganese. Prospective reserves are estimated at several million tons.

MEXICO—*Paredes' Brothers* are now exploring a new mercury mine about five miles southwest of Vicente Guerrero. The ore has an average content of six kilos of mercury per ton. The Paredes Brothers are also associated with *Cia. Internacional Hermes* in development of the *Vicente Guerrero* mine located at Huahuaztla, state of Guerrero.



Superphosphate Plant To Be Built in Mexico

Construction of the first triple superphosphate plant in Mexico has been undertaken by Guanos y Fertilizantes de Mexico S. A. at Coatzacoalcos, Veracruz. The plant, which is scheduled to begin production early in 1960, will have initial capacity of 150 metric tons per day and will be designed to permit doubling of facilities at a later date. Phosphate rock imported from Florida will be used as raw material. Pictured above is an artist's conception of the project, with the sulfuric acid plant and sulphur and phosphate rock unloading and storage facilities shown at the upper left. Near the center are the phosphoric acid plant and triple superphosphate production section with storage building for the latter at left. The low buildings at right center are offices, laboratory, changehouse, cafeteria, and guest houses. The plant is designed and engineered by Dorr-Oliver Incorporated, Stamford, Connecticut. Its construction is part of a Mexican government program planned to increase Mexican industrial independence.

MEXICO—Jose Lorenzo Sepulveda is exploring the *La Gloria, La Laurita, El Porvenir,* and *La Protectora* mines in the municipality of Badiraguato, state of Sinaloa. The ore reportedly contains gold, silver, nickel, and cobalt. Once the property is developed, arrangements will be made for installation of a flotation mill. Jesus R. Rico is engineer in charge of the exploration work.

PANAMA—*Kaiser Exploration Company* has ceased its geological investigations in western Panama where the company had obtained a bauxite concession over a large area near the Costa Rican border. The *Aluminum Company of America* continues its interest in the area, however. Kaiser is also exploring in Brazil's Amazon Basin district.

CHILE—*Chile Exploration Company* has developed additional oxide ore reserves in drilling on the north and northeast portions of the *Chuquicamata* ore body. In addition to drilling last year, the company also stepped up its stripping program. The emphasis has been on copper production for a while, but with the reduced demand for copper the firm is catching up with stripping at a rate of about 40 percent of its production.

PERU—*Cerro de Pasco Corporation* has temporarily suspended any further exploration and development work of the *Antamina* ore body. The property is located about 100 miles northwest of the town of Cerro de Pasco, and has an indicated ore body of approximately 100,000,000 tons of 1.5 percent copper.

VENEZUELA—*Baritina de Venezuela S.A.*, in which the *National Lead Company* has a substantial interest, has opened two new modern barite processing plants in Venezeula. Raw material for the new plants is being supplied by a mine and processing operated by the company on the island of Canamu off the coast of Brazil.

MEXICO—*Nuevo Laredo Mines S.A.*, under the management of Luis G. Olloqui, has been investigating the *Cinabrio* mine located at San Pedro Ocampo, Municipality of Concepcion del Oro, state of Zacatecas, for its commercial possibilities. The mercury ore occurs in the form of cinnabar impregnated in the limestone. It averages about three kilos of mercury per ton, with some high-grade pockets.

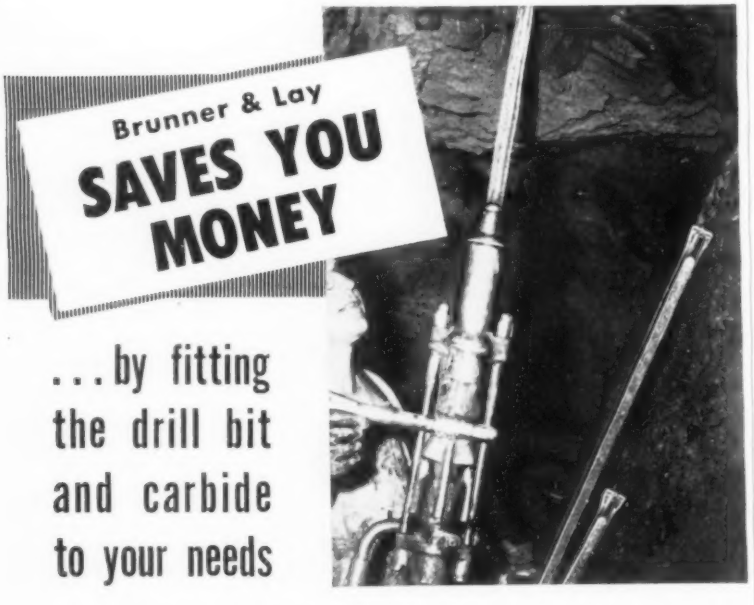
CUBA—The *Moa Bay Mining Company*, a subsidiary of *Freeport Sulphur Company*, has launched an international scholarship plan for four Cuban students. The company will pay up to $3,500 each for these students to study in United States schools next year, and will also grant $500 to each of the universities attended by the Cuban students. One fellowship will be given in the field of atomic energy as applied to medicine; the other three will go to candidates in the fields of mining and metallurgy, geology, chemical engineering, the physical sciences, and other related fields. The Institute of International Education in New York City will administer the fellowships for the company.

PERU—Official figures just received by MINING WORLD show the metal production of the country for 1956 and 1957, as follows:

Metal	1956	1957*
Gold (grams)	4,947,767	5,024,903
Silver (kilograms)	714,533	777,338
Copper (metric tons)	46,236	57,206
Lead " "	129,075	132,531
Zinc " "	175,120	137,971
Antimony (kilograms)	969,323	983,398
Bismuth "	287,924	371,696
Cadmium "	48,322	44,817
Tin "	2,751	4,160
Mercury	11,556	16,351
Iron ore (metric tons)	2,919,700	3,579,456
Manganese (kilograms)	4,613,753	5,114,897
Tungsten (kilograms)	675,670	677,724

*Estimated

SURINAM—The *Aluminum Company of America's* Surinam subsidiary, *Surinam Bauxite Company Ltd.*, has been incorporated as a Western Hemisphere trading company called *Suriname Aluminum Company (Suralco)* registered in Delaware. Suralco will build and operate the 60,000-ton aluminum smelter at Paranam expected to go into operation when power becomes available. Within a period of 12 years, the firm will also put into operation an alumina plant producing enough alumina for the smelter. Until 1968 Suralco will have exclusive bauxite exploration rights on nearly 5,000,000 acres of land in northeastern Surinam. Included are the bauxite deposits of Nassau Mountain, containing between 15,000,000 and 20,000,000 tons of bauxite, and those of Lely Mountain. From 1968 until 1978



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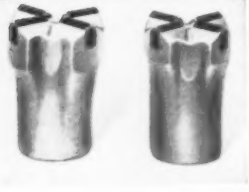

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Suralco will have exploration rights on nearly 1,250,000 acres selected out of 5,000,000 acres. Suralco may ultimately choose 50,000 acres to mine bauxite. Total expenditure for exploration will be $5,000,000. The company has an option to participate in another hydroelectric project, the Tapanahony project, by which the original Brokopondo project may be expanded several times its initial size. The government has already started preliminary investigation for this new project.

INDIA—The new 53-mile Bhilai-Dhalli-Rajhara branch line on the Nagpur section of the South Eastern Railway has been officially opened. Built at a cost of Rupees 4,60,00,000, the new branch line will facilitate movement of iron ore from Dhalli Rajhara region to the steel plant at Bhilai. About 3,000,000 tons of iron ore are expected to be transported annually because of the new line. According to the chief engineer of the Bhilai plant, the production cost of Bhilai steel is expected to be about 50 percent less than the original estimate because of the high percentages of iron in the iron ore, varying from 62 to 68 percent.

MALAYA — The 16,000-square-mile aeromagnetic survey of Malaya, sponsored jointly by the Canadian and Malayan governments under the Colombo Plan, has been completed and the report officially presented to the Federation Minister of Natural Resources. Unusually high energy gamma rays possibly indicating existence of radioactive deposits were encountered during the survey. Evidences of iron and tin were also indicated in the Kedah, Trengganu, and Johore areas. Much field work will have to be done before these potentials can be fully appraised. The work of mapping about one-third of Malaya's area was undertaken by the *Canadian Spartan Air Service* and *Canadian Aero Service Ltd.*

TURKEY—The *Etibank* is reported to have taken over development of the large colemanite deposit ($CaB_6O_{11}{\cdot}5H_2O$) found by the *MTA Institute* early last year. The deposit is located in the vicinity of Kutahya, and its reserve is estimated at 7,000,000 tons.

INDIA—According to the *Indian Bureau of Mines*, the country produced 1,574,000 tons of manganese ore during 1957. The three major producing states, Orissa, Bombay, and Madhya Pradesh, accounted for 582,000 tons, 359,000 tons, and 329,000 tons, respectively. Among the other producing states, Mysore accounted for 262,000 and Andhra 193,000 tons. A Rupees 1.75 crore plant for ferro-manganese production has opened at Joda in Orissa state. This is one of several new plants under construction or recently completed in these major production areas.

MALAYA—*Kundang Tin Dredging Ltd.* expects its arrangements with *Taiping Consolidated Ltd.* to terminate automatically at the end of the year when the reserves Taiping is working are expected to be exhausted. Taiping produced 656.25 tons of tin concentrates in 1957 from the Kundang property, which was 130.95 tons less than in 1956.

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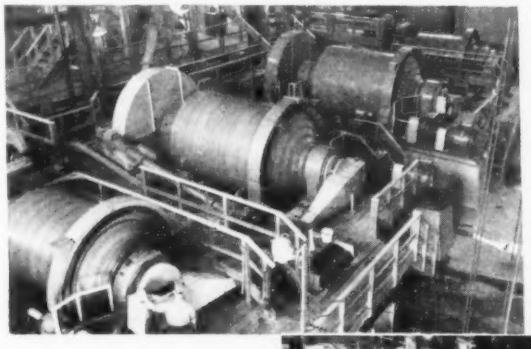
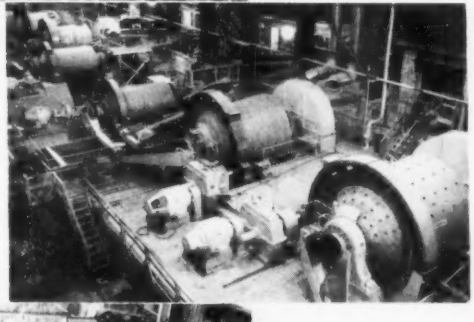
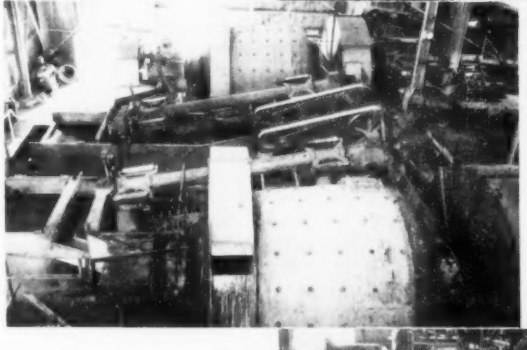


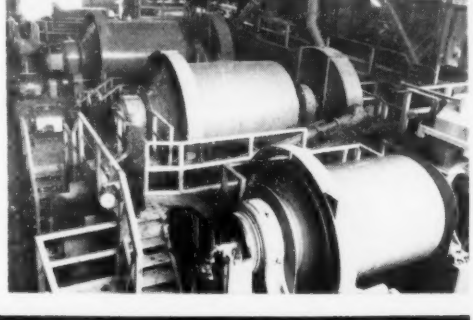
← **Hardinge 6'x8' Rod Mills followed by Hardinge 9'x11' Autogenous Pebble Mills in closed circuit with classifiers. Application: Uranium Ore.**



→ **Four 7'x10' Hardinge Rod Mills four Hardinge 10½'x10'x9' Tricone Ball Mills Application: Uranium Ore.**



← **Two Hardinge 11'x3'x6'x10' Tricone Ball Mills. Application: Uranium Ore.**



→ **Twin installation to first shown above but on another property: Two Hardinge Rod Mills and two Autogenous Grinding Pebble Mills using sized rock as grinding media. Application: Uranium Ore.**

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KOREA—*Richard S. Whitcomb and Company*, representing a United States firm, has proposed to the *Mining Bureau* of the *Ministry of Commerce & Industry* the development of more than 10 alluvial gold mines in Chungju, Puchon, Chonam, and Kumje. The firm proposes to lease a dredge for these properties, and the Ministry has agreed to study ways and means of importing such a dredge, even prior to the establishment of the foreign investment law.

MALAYA—More than one-quarter of the tin mines in North Malaya (Perak, Province Wellesley, Kedah, and Perlis) have closed because of the quota restrictions on tin production. Many of the mines which are "ungrouped" have ceased production because they have used up their quotas for the current period; other mines have grouped together so that their combined quotas could be shared. One of the latter closings was the dredge operated by *Larut Tin Fields Ltd.*, one of the *Anglo-Oriental* group. This company has announced that it is not possible to work on the low-grade deposits economically on an intermittent basis. The balance of the firm's quota will be transferred to another company under Anglo-Oriental management.

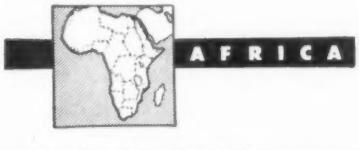
PAKISTAN—A geological expert, Russell Gibson of the United States, has been sent to Pakistan under the *United Nations Technical Assistance Administration* to advise the government's *Atomic Energy Commission* on a comprehensive program for surveying atomic raw material resources in East and West Pakistan. He will also make a preliminary survey, and recommend training of local personnel. He was sent on a one-year assignment at the request of the Pakistani government.

CHINA—Large deposits of a comparatively rare mineral, Iceland spar, have been found in the Szechwan Province, according to the New China News Agency. This is the raw crystal from which optical lenses are made.

INDIA—The Indian government is said to be considering a proposal for the bulk sale of manganese ore to the United States in return for imports of wheat.

TURKEY—Nickel silicates (garnierite, etc.) have been recognized as a persistent accessory in a huge conglomeratic sandstone near Ciftchan, 70 miles northwest of Adana in South Turkey. The mineralized mass is estimated at about 500,000,000 tons. Detailed investigations and exploration are underway.

CHINA—Tin from China is beginning to appear on the world market for the first time since World War II. It is believed this is occurring either because the Soviet Union is no longer a customer or because Chinese production has increased. The situation is definitely a threat to the stability of the export quota restriction system being established by the International Tin Council.



UNION OF SOUTH AFRICA—Recent discussions between representatives of *Combined Development Agency* (buyers of uranium oxide on behalf of the United States and British atomic energy commis-

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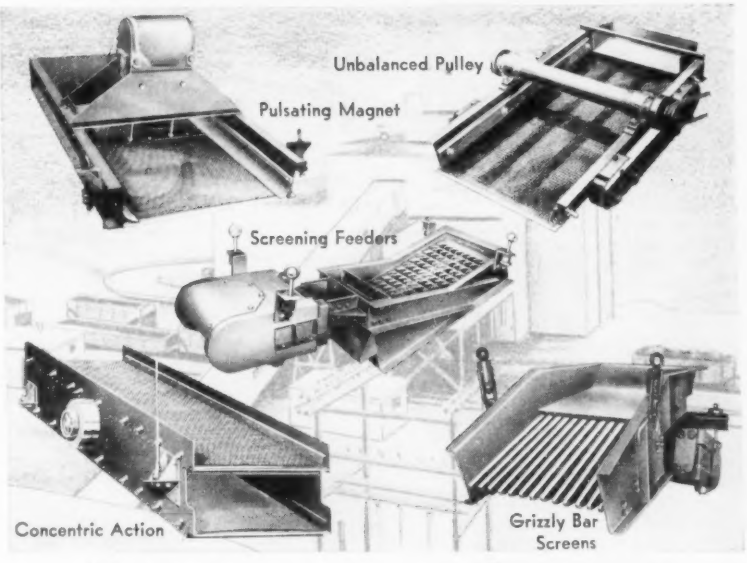

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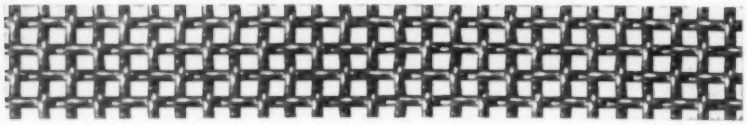

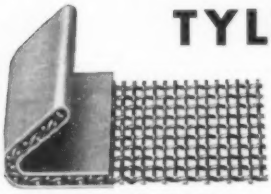

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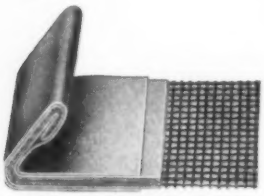

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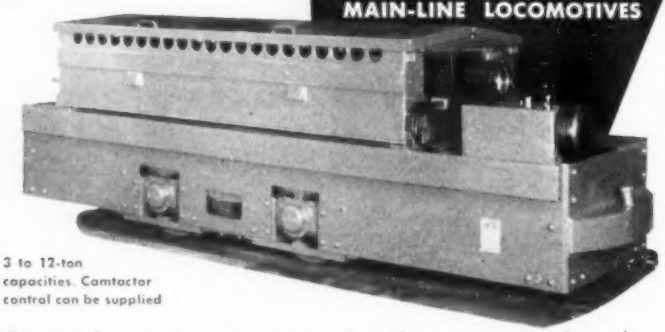

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sions) and the *South African Atomic Energy Board* have resulted in setting of a ceiling on purchases from South Africa. This ceiling has been established at 6,200 tons of uranium oxide per year from July 1, 1958. Any available output above this maximum may now be disposed of elsewhere without approval by the Agency but still under license or permit by the South African Board. South African output in 1957 amounted to 5,699 tons, and increased to the annual rate of 5,929 tons in the first quarter of 1958.

FEDERATION OF RHODESIA & NYASALAND—Rapid progress continues at *Mufulira Copper Mines'* West ore body, and the 200,000-ton-per-month copper concentrator is scheduled to start up toward the end of 1960. The Prain's service shaft headframe was completed at the beginning of the year and construction of the adjacent ore hoisting headframe is well underway. Initially, two skips will be used for ore hoisting but provision will be made for an additional two skips should these be necessary later to cope with an anticipated doubling of milling capacity.

EGYPT—Intensive development work has been carried out at *Gemsa* sulphur mines on the Red Sea coast, and the mines have been prepared for large-scale operation. Delivery of the milling plant has been delayed, however, because of the shipping difficulties arising from the Suez Canal conflict. It is hoped now that the plant will be ready for operation early in 1959.

FEDERATION OF RHODESIA & NYASALAND—*Rhodesia Broken Hill Development Company Ltd.* has nearly completed the installation of a heavy media separation plant. The blast furnace section of the lead smelter satisfactorily produced most of the lead in 1957, but sintering reduced output below expected levels and operating costs were higher than optimum. With the lead price easing, it was consequently decided to restart the Newman hearth plant which, while producing less, gives a better profit margin through lower costs. In 1958, therefore, lead output will fall below the demand levels in Southern Africa.

SOUTH WEST AFRICA—Prospecting operations by surface drilling and underground development at *South West Africa Company's* property at *Berg Aukas* have indicated at least 500,000 tons of lead-vanadate ore between surface and a depth of 600 feet in two lenses. The full dimensions have yet to be determined. A third, deeper, body, contains secondary zinc minerals with some concentrations of zinc sulphide but has little vanadium or lead. Its tonnage, to a depth of 1,000 feet, is tentatively estimated at about 400,000 averaging about 35 percent zinc. To aid exploration some underground development of the upper lenses is being done on the 200- and 300-foot horizons. The ore developed in the course of this work, together with ore from some exploratory stoping between these levels, is being treated in the mine's small mill at the rate of about 50 tons per day.

FEDERATION OF RHODESIA & NYASALAND—*Bancroft Mines* which ceased production in April is now pursuing an active program of underground development. It is confidently anticipated by the management that the mine will be developed within 12 months to the stage where no difficulty will be experienced in maintaining the rated annual capacity of 40,000 long tons of recoverable copper in concentrate. Additional pumping equip-

ment has been installed and over 19,000,000 gallons of water are being pumped from the mine each day.

UNION OF SOUTH AFRICA—*Virginia Orange Free State Gold Mining Company Ltd.* is modifying its hoisting facilities. The steel headframe at the No. 2 shaft has been demolished and will be replaced by a reinforced concrete headframe, 190 feet high. This shaft will then be used for hoisting a greater tonnage of waste rock, releasing No. 1 shaft from that duty and permitting the hoisting of a greater tonnage of ore in line with the extended capacity of the gold plant to 125,000 tons monthly. Virginia O.F.S. is a subsidiary of the *Kennecott Copper Corporation.*

FEDERATION OF RHODESIA & NYASALAND—*Rhodesia-Katanga Company Ltd.* is providing additional working capital of £100,000 to its subsidiary, *Kansanshi Copper Mining Company,* to meet the cost of proposed metallurgical investigations and to finance caretaking operations at the mine which has been closed since last October, and allowed to flood. Management feels that it will be possible eventually to develop the oxide ore reserves which until now had not been amenable to treatment.

TANGANYIKA—An exploration team is undertaking a program of diamond drilling and a geological survey of the *Mpanda* mine of *Uruwira Minerals Ltd.* and its associated ore bodies and prospects. The company has, through numerous causes, including the drop in metal prices and lower grade of ore being mined, found itself for the time being unable to meet its obligations to the two principal creditors—the governments of Tanganyika and the United States. An agreement has been reached among the parties involved which, basically, provides that steps be taken to ensure that the mine is run with the major objective of paying off its debts in the shortest possible time without departing from sound and approved mining, milling, and marketing methods. One of the steps is the exploration work now going on to seek additional reserves.

FEDERATION OF RHODESIA & NYASALAND—*Messina (Transvaal) Development Company Ltd.* has completed a survey of the 50 square miles of its exclusive prospecting concession surrounding the *Alaska* copper mine, recently acquired, and now has had the concession extended over 90 square miles. A more detailed survey and geochemical investigation is now in progress. Further drilling in the *Sanyati Mines* property has increased the estimated ore reserves to 15,119,000 tons averaging 1.4 percent copper, 1.35 percent lead, and 2.85 percent zinc. A three-compartment shaft will be sunk to facilitate start of underground exploratory development. Drilling is also continuing in an iron pyrite deposit in the Mazoe area where results to date have disclosed variable quality and thickness. Geophysical prospecting has been resumed in the nickel prospect of the Lomagundi district, using induced polarization apparatus.

GHANA—*Ariston Gold Mines (1929) Ltd.* has decided to sink a new internal shaft, to be known as the No. 4 winze, now that it has been confirmed that the No. 2 ore body is improving with depth, and also that the dip of the reef appears to be flattering. The shaft will be sunk first from the 24th to 30th levels, and, ultimately, to the 40th. This project will not only expedite immediate develop-

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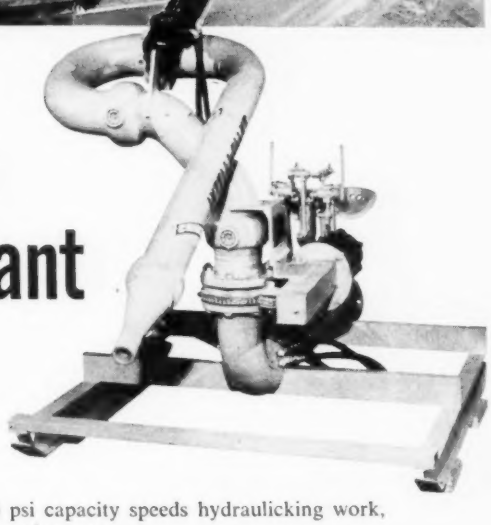

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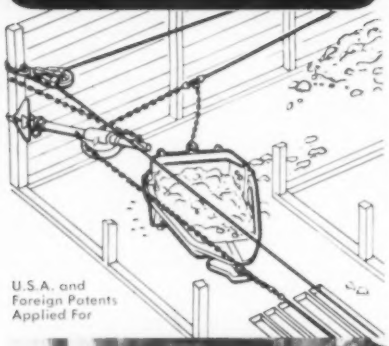

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ment but will facilitate opening up of the whole area at depth. The first part of the program will take about four years to complete. The sinking of the Central Shaft has also been resumed from its present depth at the 25th level to a final depth at the 31st level, about 900 feet. A pilot sinking winze has been making good progress and it is anticipated that full-scale sinking will be started during the current year. In future years, when conditions permit, it is intended to consider the further exploration of the northern area by following upward extensions of the North ore body and, in addition, the company will intensively pursue opening-up of an area known as South Orebody (previously known as Gamma Shaft Area) lying between Ariston and *Main Reef's* present known ore bodies.

EIRE—*Emerald Isle Mining Company* is reported to have found an asbestos vein at Allihies in west County Cork where the firm has been reopening the *Mountain* mine. A detailed examination is being made to determine further details of the mineralization.

BELGIUM—*Centre d'Etude de l'Energie Nucleaire* (CEN) has awarded a $1,200,000 contract to the *Brush Beryllium Company* of Cleveland, Ohio for fabricated beryllium metal. The order was placed by *Nuclear Development Corporation of America* of White Plains, New York, acting as agent for CEN. Nuclear Development also designed the nuclear reactor which will use the beryllium. The contract calls for Brush to fabricate two core matrices for Belgian Reactor–2, a high-flux materials and engineering test reactor now under construction at Mol. It is one of several nuclear research facilities of CEN, and will be used in comprehensive testing programs in the development of nuclear reactors in Europe. Brush will produce the beryllium for the matrices by its QMV powder metallurgy process.

WEST GERMANY—The economies committee of the Lower House in Bonn is giving consideration to the problems of the lead and zinc mines in West Germany. One possible plan for aid is to give the mines a respite from taxation, which German law permits in cases of hardship, plus Federal and State credits. Last year German lead production totaled about 70,500 tons, or nearly nine percent more than in 1956. Zinc output rose by two percent to about 94,000 tons. Cost of production, however, was considerably greater (by about 30 percent) than international price levels.

SWITZERLAND—The *Copper Development Directors' Committee* met in Geneva recently to continue the increasing cooperation which is being made among European copper development centers for promotion of the use of copper. The Committee was formed early in 1957 by the heads of the development centers or associations in France, Great Britain, Germany, and Switzerland. Since then a representative from a committee of the four Scandinavian countries has joined the group, and similar centers are

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ITALY—A Loro-Parisini sulphur recovery plant has been installed at the *Montagna Aragona* sulphur mine in the Agrigento district. It has a capacity for treating 100 tons of ore per day.

SPAIN—Negotiations are reportedly underway between Spanish and Czechoslovakian government delegates to reach an agreement on exchanging manufactured goods and ores. Spanish iron ore miners hope to find a new market for their production since German ore buying has been less active this year.

RUSSIA—The Soviet Union's most important copper deposits are located in Kazakhstan, the Urals, Uzbekistan, the Altai, the Krasnoyarsk area of Central Siberia, and in Armenia. According to a recent report, three main types of copper ores are mined. Chalcopyrite is found in the Krasnoyarsk area; ore from copper-molybdenum veins is mined in central Kazakhstan and Armenia; and copper conglomerate averaging 26 percent copper is found in the Dzhezhazgan area of northern Kazakhstan. The ratio of ore produced and copper extracted in percent of the total output in 1957 is: conglomerate, ore mined, 26, copper extracted, 25.8; pyrite, ore mined, 26, copper extracted, 36.9; copper-molybdenum, ore mined, 21, copper extracted, 20.2; miscellaneous ores, ore mined, 27, copper extracted, 17.1. It is believed other important copper deposits may be developed in central Kazakhstan, southern Urals, northern Caucasus, and in Siberia east of Lake Baikal.

FRANCE—The first shipment of uranium to fuel a French reactor has been received from the *United States Atomic Energy Commission*. The shipment is valued at $118,000 and contained a total of 35 fuel elements. The uranium will be used in a pool-type reactor called "*Melusine*" to be constructed at the *Center of Nuclear Studies* in Grenoble. The reactor was designed by *Indatom*, a private French atomic engineering firm.

SWEDEN—*AB Atomenergi*, Sweden's nuclear energy development company, celebrated its tenth anniversary this year. In 1953 the company began operating a uranium plant with initial output of five tons annually, which was subsequently increased to 10 tons, and further expansion to 120 tons per year is now planned. An experimental reactor, located in Stockholm, came into operation in 1954, and a larger reactor, located at Studsvik, is now nearly completed. Construction of three commercial reactors is also underway. A combined heating and power plant under construction at Farsta will be operated by the City of Stockholm, and the Swedish State Power Board will control the Adam heating plant at Vasteras and the Eve power plant in the Tiveden region.

RUSSIA—Iron ore reserves of the Soviet Union are second in size only to the United States and represent approximately 25 percent of the world's reserves, according to a recent study published in Russia. In order of average quality, however, Russia places fourth. The study also indicated that it would be necessary to mine increasingly lower grade ore. Of the total industrial iron ore reserve, only 12.5 percent is direct shipping rate averaging 51.5 percent of contained iron. By 1955, the proportion of crude ore that had to be beneficiated was 42 percent of the total, and the proportion is rapidly increasing.

NORTH AMERICA

BRITISH COLUMBIA—*Giant Mascot Mines Ltd.* starts deliveries of barite to *McPhail Engineering Company* of Tacoma, Washington this month, at a rate of 1,500 tons monthly. The order may be increased to 3,000 tons montly after an initial six-month period. This is a new source of revenue for the firm which closed down its lead-copper-silver property near Spillimacheen last year after depleting the ore reserves. Barite has been found in the mill tailings and there are said to be at least two occurrences in the mine that could produce barite.

ONTARIO—Two high-altitude, long-range, photographic B-17 airplanes of the *Photographic Survey Corporation* are participating in the Canadian government's $6,300,000 aerial survey of the Arctic Islands. The 500,000-square-miles project being sponsored by the Department of Mines and Technical Surveys is the largest of its kind ever undertaken. The work is expected to take four to six summer seasons to complete.

ALASKA—The famous *Kennecott* copper mine closed in 1938 is scheduled to

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be reopened by its new owner, Ray F. Trotachau. Also to be reopened is the *Dan Creek* mine, purchased by the *C & P Mining Company Inc* of Anchorage. Associated with both ventures is Gordon Hizen who reports crews are preparing both mines for production. The Dan Creek is worked for gold, silver, and copper. It is located about 30 miles east of Anchorage and about 200 miles northeast of Cordova, linked to Kennecott by road. It will be placer mined with hydraulic equipment under the name of *Sultan Hill Mill and Mining Company*.

BRITISH COLUMBIA—After extensive diamond drilling of copper deposits at the *Bethlehem Copper Corporation* property in Highland Valley, *American Smelting and Refining Company* has suspended work and returned the property to Bethlehem. According to A. A. Brown, Asarco's vice president in charge of mining operations, results to date had indicated the presence of low-grade copper reserves not sufficiently promising to equip the property or continue further exploration. Bethlehem Copper is now proceeding with an underground program on the property. This will include driving an adit to investigate two main zones, the Jersey and the East Jersey, and possibly a third zone, the Iona.

NORTHWEST TERRITORIES—*Salmita Consolidated Mines Ltd.* has reopened its field office and warehouse in Yellowknife as an operational base and plans to resume development work on its gold property on Matthews Lake. Before suspension of activities on the 31-claim group, the firm is said to have invested about $1,000,000 in the property, including sinking of a shaft to the 125-foot level. Paul Gliddon has been appointed general manager.

ALASKA—*Gold Placers Inc.* is operating its dredge on Woodchopper Creek this season. Operations on the nearby Coal Creek have been closed down for the time being. Woodchopper Creek empties into the Yukon River above Circle City.

BRITISH COLUMBIA—An extensive exploration and development program is planned by *Canada Radium Corporation, Ltd.* at the *Silver Bell* and *Horn Silver* properties in the Osoyoos Mining Division, four miles north of the United States boundary. A 1½-mile access road has been built to the one-time producers of high-grade silver and gold. W. L. Hodgson of Toronto heads the firm.

QUEBEC—*Gaspe Copper Mines Ltd.*, subsidiary of *Noranda Mines Ltd.*, is now averaging slightly more than 6,500 tons per day from its mine; rated capacity of the concentrator is 6,500 tons. Current output of copper anodes is somewhat more than 3,000 tons per month. Gaspe has also undertaken smelting of customs concentrate from Newfoundland. A small tonnage was treated last fall and production this season is expected to be about 4,000 tons per month.

MANITOBA—Diamond drilling on the *Seal River* properties of *Jellicoe Mines Ltd.* has indicated the existence of a high magnetic anomaly. The company also plans to test for other base metals, particularly nickel.

QUEBEC—*Sigma Mines Ltd.* has decided to sink a new internal shaft at its gold property in the Val d'Or district. The present shaft goes to the 24th level, with main production still coming from above the 16th level. The new shaft would go to the 30th. Also planned is the expansion of the main No. 2 surface shaft from the 8th level to the surface. This will be enlarged and retimbered to provide a fourth or service compartment. Below the 8th level to the bottom, this shaft already has four compartments. Preparation for this work will take about a year before sinking can actually start.

BRITISH COLUMBIA—*Taiga Mines* is reported to have discovered germanium in the Powell River area about 65 miles northwest of Vancouver. Some 100 claims have been staked by the company, and full investigation is underway.

ALASKA—The *United States Geological Survey* has contracted with *Petroleum Helicopters Inc.* of Lafayette, Louisiana for about 1,000 hours of flying time during the 1958 summer season for both geologic and topographic mapping.

BRITISH COLUMBIA—Construction of the province's first expanded shale plant is planned by *British Columbia Lightweight Aggregates, Ltd.*, on Saturna Island, at a cost of about $600,000. About 50 men will be employed. Philip D. Graham of Vancouver is president.

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NORTHERN TERRITORY—*New Merloo Gold Mines N.L.* at Tennant Creek is ready to recommence production. In addition to its present leases, the company has now purchased an option over the *Joker* gold mine, five miles east of *Australian Development's Nobles Nob* mine. Options have also been secured over the *Skipper, Skipper Extended, Arcadia*, and *Westward Ho* mines, which are five miles east of the New Merloo mill.

REPUBLIC OF THE PHILIPPINES—*Philex Mining Corporation* has placed its new Santo Tomas mill in operation on its copper property in the Baguio district. Successful test runs have been completed, and full operation at a rate from 1,500 to 2,000 tons per day is underway. The concentrates will go to *Nippon Mining Company* of Tokyo.

NEW CALEDONIA—*Societe Le Nickel*, which has been producing 40,000 tons of ore monthly from its mines at Thio, has reduced output and cut personnel by 25 percent. The company reportedly has a stockpile of more than 250,000 tons of ore. A few miles away, the *Le Bornet* mine is about ready for production but this property will be held in reserve. The company is proceeding with the 1,000,000,000 (estimated) Pacific Francs reconstruction and modernization program at the Doniambo smelter at Noumea.

INDONESIA—1957 production figures have just been received from MINING WORLD's correspondent in Indonesia. Total tin output for the year was 27,721.8 long tons, coming from the islands of Bangka, Belitung, and Singkep which produced 17,291.3, 8,998.4, and 1,432.1 long tons, respectively. During the year the country also produced 53,356 metric tons of manganese, compared with 107,826 tons in 1956, and 241,467 metric tons of bauxite, compared with 303,300 in 1956. The bauxite was mined only on the island of Binta, south of Singapore, by the *N.V. Nederlands Indonesische Bauxiet Exploitatie Maatschappij*, a subsidiary of the well known *Billiton* company. Total production of gold was 137,164 kilograms, compared with 76,070 in 1956, and 1,331 kilograms of silver were produced in 1957. Companies mining these ores were *Perusahaan Tambang Emas Tjikotok* in south Banten, West Java, which is a state owned corporation, and *N.V. Exploratie Maatschappij Bengkalis*, a private firm operating on the east side of central Sumatra where it has an alluvial river deposit and bucket line dredge.

NEW SOUTH WALES—*Wellington Alluvials Ltd.*, last major gold producer in the state, has ceased dredging on the Macquarie River. A series of test holes recently completed ahead of the dredge gave disappointing results and a long term look also indicated that dredging operations will remain unprofitable. The company, which has been sponsored by *Broken Hill Pty.*, will be liquidated.

REPUBLIC OF THE PHILIPPINES—The United States is reported to be considering again the legislation enacted in the 1930's which authorized a $24,000,000 compensation to the Philippines for losses suffered when the United States abandoned the gold standard. Congress did not follow up the action with an appropriation and the decree has been on the books ever since.

SARAWAK—*Semantan Bauxite Ltd.* is reported to have made its first shipment of bauxite. The load of 6,000 tons, destined for Formosa, is part of a 50,000-ton order. Production from the Semantan de-

posits is to be increased to 33,000 tons monthly, according to company officials, with Japan and Formosa as the principal destination for these exports.

WESTERN AUSTRALIA—Following its policy of attempting to diversify activities, *Western Mining Corporation* has been granted a Temporary Reserve to prospect for bauxite in the Darling Ranges in the southwest part of Western Australia. The company also holds a Temporary Reserve for copper in the Tarraji River area in the West Kimberly district. Four outcrops have a total length of 6,000 feet in hilly country but the hills die away into plains deeply covered with soil. Where creek channels have made exposures in these plains, significant showings of copper occur. The area will be investigated by a geological and geophysical team.

REPUBLIC OF THE PHILIPPINES—*Marinduque Iron Mines Agents, Inc.* reports it is going ahead with its expansion program despite adverse developments in the last few months. The company plans to increase daily treating capacity of its mill in Sipalay to 5,000 tons to attain maximum copper recovery. Also planned is a speed-up in erection of the 600-ton mill now under construction in Bagacay for operation early in 1959, and continuation of plans to set up a smelter and sulphuric acid plants.

WESTERN AUSTRALIA—The Western Australian government has granted *United Uranium N.L.* a Temporary Reserve of 24 square miles over a uranium discovery near Halls Creek in the East Kimberley field. Low-grade uranium mineralization occurs in ferruginous conglomerate beds in a similar manner to the Blind River deposits of Canada. Ore reserves at the company's main property in the South Alligator River of Northern Territory now stand at 125,000 tons containing 875,000 pounds of U_3O_8. 20,000 tons of ore have been stockpiled at the former Northern Hercules mill for treatment during the coming wet season.

NEW SOUTH WALES—*Zircon Rutile Pty.* at Byron Bay, part of whose plant was destroyed by fire last December, has rebuilt and is again producing rutile and zircon. (In the meantime, mineral was supplied from other plants of the company to meet contracts.) The company reports some improvement in zircon sales.

REPUBLIC OF THE PHILIPPINES—The Bureau of Mines reports that 1957 mineral production in the Philippines totaled the highest in the history of the country with a value surpassing Pesos 200,000,000. In actual production during the year were 31 metal mines, compared with 32 in the previous year. These were: eight lode gold, four chromite, five copper, five iron, eight manganese, and one quicksilver mine. During the year, seven metal mines went into or resumed production: *Benguet Exploration Inc., Sipalay* copper project of *Marinduque Iron Mines Agents Inc., Roxsal Mines, Philippine Base Metals Inc., Northern Luzon Mining, Jecel Mining Corporation*, and *General Base Metals Inc.*

QUEENSLAND—Mill construction of *Mary Kathleen Uranium Ltd.* at the new town of Mary Kathleen is well ahead of schedule. Production will start before the end of the year from ore already stockpiled. A modern highway now joins Mary Kathleen with Cloncurry. It is expected that initial rate of U_3O_8 output will be 500 short tons per year.

Grab Samples

Continued from page 3

fuse and No. 6 caps. There was no apparent dislocation of the explosive column using the safety fuses, which were cut to fire in sequence, one after another.

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The last blast could not possibly have been effective due to the single stick of 45 per cent powder. The nitrate definitely did the work. The benches were cracked badly two or three feet behind the new brow after each blast, and it may be that the nitrate quantity can be reduced even further.

Further nitrate blasting will be done in the future at Coto and also at the Irisan lime quarry of Benguet Consolidated, Inc., in order to determine more carefully the necessary nitrate quantities required for varying rock conditions. There are tremendous possibilities for ammonium nitrate blasting in small diameter holes with resultant savings, and it appears that nitrate blasting can be used much more widely than has been apparent.

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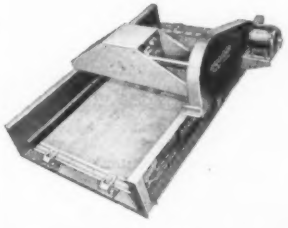

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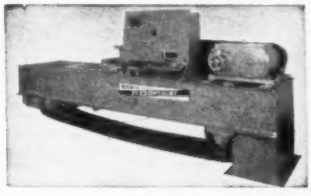

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Foreign Copper, Valley basis ..... 26.50¢
Custom ..... 26.50¢
LEAD: **Common Grade.** New York ..... 11.00¢
Tri-State Concentrate, 80% lead $127.32
ZINC: **Prime Western:** F.o.b. E. St. Louis ..... 10.00¢
Prime Western: Delivered, New York ..... 10.50¢
Tri-State Concentrate, 60% zinc, per ton $56.00
ALUMINUM: **Primary 30 Pound Ingots (99% plus).** ..... 26.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** ..... 29.50¢
BISMUTH: (In ton lots) price per pound $1.55
CADMIUM: **Sticks and bars.** 1 to 5 ton lots (Price per pound) $1.70
COBALT: **97.99%,** keg of 550 pounds (Price per pound) ... $2.00
COLUMBIUM: **Powder** ..... Nom., per pound $120.00
GERMANIUM: **Germanium:** dioxide, high purity, gram .. 24.00¢-30.00¢
LITHIUM: **98%** (per pound) ..... $11.00-$14.00
MAGNESIUM: **Ingots (98.8%)** F.o.b. Valasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $228.00-$231.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%,** per pound $7.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (per pound) Prompt delivery. 94.625¢
TITANIUM: **99.3%** + Grade "A" Sponge (Price per pound) $1.65-$2.05
URANIUM: **Nominal,** per kilogram $40.00
U-235: **Nominal,** per pound $7.725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 88⅝¢
PLATINUM: Per Ounce ..... $67.00-$70.00
ZIRCONIUM: **Sponge, Per Pound,** Reactor Grade $7.50

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio ..... $46.00-$47.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $36.00-$37.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio .... Nominal $53.00
U.S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots, $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12, 1957) ..... Per Pound Pentoxide ..... $1.15-$1.35
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit.. 26.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn. Long ton unit ..... $1.20-$1.25
Metallurgical grade. 46 to 48% Mn. Long ton unit ..... $1.15-$1.20
Metallurgical grade. 44 to 46% Mn. Long ton unit ..... $1.10-$1.15
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Mont.; base $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40%. Base (48%) $2.30 per unit with premiums and penalties.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo. plus container cost $1.18
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit $14.00
Foreign. 65% WO_3 Per short ton unit (Scheelite) .. Nominal $15.00
Foreign: South American, Spanish, Portuguese .... Nominal $12.50
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BENTONITE: **Minus-200-mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: Technical grade .... F.o.b. Boron, California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines .... $38.00-$40.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $48.00-$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

LONDON METAL AND MINERAL PRICES

June 17, 1958

		Per Long Ton	USA Equivalent cents per pound
COPPER:	Electrolytic spot	£202 0s 0d	25.2 ¢
LEAD:	Refined 99%	£ 72 15s 0d	9.07¢
ZINC:	Virgin, 98%	£ 63 15s 0d	7.96¢
ALUMINUM:	Ingot, 95.5%	£180 0s 0d	22.50¢
ANTIMONY:	Regulus, 99.6%	£197 10s 0d	24.69¢
TIN:	Standard, 99.75%	£730 0s 0d	91.2 ¢
TUNGSTEN:	Long ton unit	72s	$10.08

With Sterling pound at $2.80

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

ALLISON STEEL MANUFACTURING COMPANY

Mine and Mill Buildings • Mine Rails • Ore Cars • Steel Gallows Frames • Ball Mills • Muck Plates • Crucible Drill Steel

We offer a complete repair service to the Mining Industry. Our new Machine Shop is equipped to handle your work quickly and economically.

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Liquidating all machinery at Last Chance Mine(mang) near Winslow Arizona.

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Complete WEMCO #2M Mob. Mill Log and spiral washers — Roll and Cone Crushers — FOUR (4) Cat 125 K.W. Generators w/complete control panel

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BALL MILLS
5—8′ x 9′ Traylor, Ball
1—5′ x 8′ Traylor, Ball
1—7 x 6 Allis-Chalmers, Ball

CLASSIFIERS
1—36″ x 19′3″ Wemco Spiral, w/drive
4—7″ x 25′6″ Dorr DSFX, Duplex
1—6′ x 23′4″ Dorr, DSF, Duplex
1—Dorr QSFB, Quadruplex

CONDITIONER
1—5′ x 6′ Wemco, Steel

CONVEYORS
1—30″ x 177′ Hewitt-Robins, Steel structure, w/magnetic head pulley
1—18″ x 95′ Hewitt-Robins, Steel structure
1—18″ x 47′ Rubber, Belt, Steel structure.

CRUSHERS
1—8 x 10 Denver Jaw, RB, New
1—15″ x 24″ Traylor Jaw, Blake Type
2—36″ x 48″ Traylor, Jaw, 125 HP Mtr.
1—2′ Symons Std. Cone, 30 HP Mtr.
1—322 Type R, Allis-Chalmers, Reduction
2—5-½′ Symons, Shorthead, 200 HP Mtrs.

FEEDERS
1—30″ x 6′ Apron Feeder, 5 HP Drive
1—24″ x 23′ Belt type, gearmotor drive
1—54″ x 16′ S.A. Heavy Duty, Apron Type
1—36″ x 72″ Jeffrey Grizzly
1—60″ Jeffrey Pan Type

FEEDERS, REAGENT
8—Clarkson, Model E, Stainless
2—#12 Deco, Cone, Dry
2—#18 Deco, Cone, Dry
10—#12 Deco, Wet

FLOTATION MACHINES
1—2-cell 36″ Fagergren
4—3-cell, 44″ Fagergren
2—2-cell, 44″ Fagergren
2—Unit Cell, 44″ Fagergren
1—3-cell #18 Denver Sub-A, 28″ x 28″
2—6-cell #18 Denver Sub-A, 28″ x 28″

JIGS
1—24″ x 36″ Denver Duplex, complete
3—12″ x 18″ Denver Duplex, complete

PUMPS, SAND
9—1-¼″ Wemco Sand, 5 HP motor
1—3″ Wemco Diaphragm, Simplex
1—2″ Wemco Diaphragm, Simplex
2—2″ Wemco Sand, 5 HP Motor
1—3″ Wemco Sand, 15 HP Motor
7—2″-3″ ASH Hydroseal "A" Frame
11—4″-6″ ASH Hydroseal "B" Frame
3—6″-8″ ASH Hydroseal "C" Frame

PUMP, VACUUM
1—14 x 8 Oliver, 15 HP Motor

FILTER
1—6′ 3-leaf Eimco, complete
1—6′ 2-leaf Eimco, complete
1—4′ 1-leaf Eimco, complete
1—6′ x 6′ Oliver, stainless steel, complete

ORE BIN
1—250-Ton Steel Ore Bin

SAMPLERS
3—Geary-Jennings Automatic

SCREENS
1—3′ x 8′ Allis-Chalmers Ripflo, 1 deck
1—3′ x 10′ Overstrom, 3-deck
2—4′ x 8′ Symons Rod Deck
1—3′ x 6′ Symons Rod Deck

THICKENERS
2—20′ x 8′ Wemco, Steel tanks
1—38-½′ x 8′ Denver, lowhead structure
1—21-½′ x 8′ Denver,
1—50′ Dorr Thickener Mechanism
1—10′ Dorr Thickener Mechanism

BLOWERS
7—TM8 Coppus Ventair, 15 HP
2—TM6 Coppus Ventair, 5 HP
5—TM7 Coppus Ventair, 10 HP
2—SP-125 Coppus Vano, Air Drive

BUCKETS
24—36″ Pacific Scraper
1—60″ Pacific Scraper
150—8″ Joy Scraper Sheaves

CAP LAMPS
165—MSA Type R, Edison, w/charger

CARS, MINE ORE
40—32 cu. ft. Ajax Type, Side Dump, 18″ Ga.
52—18½ cu. ft. End Dump, 18″ Ga.
6—20 cu. ft. Card Rocker Dump, 24″ Ga.
12—30 cu. ft. Card Rocker Dump, 24″ Ga.
4—40 cu. ft. Card Rocker Dump, 24″ Ga.
25—80 cu. ft. Card Granby Type, 30″ Ga.
19—84 cu. ft. Card Granby Type, 30″ Ga.
7—100 cu. ft. Card Granby Type, 30″ Ga.
14—130 cu. ft. Card Granby Type, 30″ Ga.
8—90 cu. ft. Card Granby Type, 24″ Ga.

COMPRESSORS, AIR
2—2500 CFM Sullivan WN4, 400 HP Motor
1—1000 CFM G-D, HA, 200 HP Motor
1—900 CFM I-R, XRE, 175 HP Motor
1—1500 CFM Worthington, 400 HP Motor
1—2000 CFM Worthington, 400 HP Motor
1—450 CFM C-P, 100 HP Motor.

DIAMOND DRILL
2—HS-15 Sullivan, air powered
1—Longyear, Model U.G. Gas Driven

GENERATOR
1—938 KVA, GMC Diesel Generator, 2200 V.
1—100 KW, GMC Diesel Generator, 440 V. Like New.

HOISTS, MINE SHAFT
1—600 HP Vulcan Denver, Double Drum
1—800 HP Nordberg, Double Drum, Excellent
1—900 HP Allis-Chalmers, Double Drum
1—375 HP W-S-M Double Drum
1—150 HP W-S-M Double Drum
1—75 HP Puget Sound, Single Drum
3—75 HP Vulcan, Single Drum

HOISTS, TUGGER & SLUSHERS
1—50 MNM4C, I-R, 3-drum, 440 Volt
4—50NM40D, I-R, 2-drum, 440 Volt
1—HDE-2 Sullivan, 2-drum, 25 HP, 440 V.
27—15NN1G I-R Slusher, 440 Volt
1—A2F211 Joy Slusher, 15 HP, 440 V.
17—7½ HP Sullivan Slusher, 440 Volt
5—HNN1J I-R Slusher, Air
3—A5NN0H I-R Slusher, Air
1—D6UL I-R Tugger, Air
3—HU I-R, Tugger, Air
9—HK I-R, Tugger, Air

LOADERS
1—105 Eimco Crawler Loader, 1-½ yd.
7—GD9H Mucking Machines, 18″ Ga.
7—GD9 Mucking Machines, 24″ Ga.

LOCOMOTIVES
10—1-½ Ton Mancha 18″-24″ Ga. Battery
3—1-½ Ton Atlas "Type J" Battery, 18″ Ga.
1—3-ton Jeffrey, Battery, 18″ Ga.
1—7-ton Plymouth Diesel, 18″ Ga., Scrubber
1—2-ton Diesel Locomotive, 18″ Ga.
6—4-ton Jeffrey Type Battery, 18″ Ga.
4—Universal Trainaire, Air, 18″-24″ Ga.
1—Eimco, Air, 24″ Ga.
1—13-ton G.E. Trolley, 30″ Ga.
3—8-ton G.E. Trolley, 30″ Ga.

TRANSFORMERS
3—1500 KVA, G.E. 110,000-2300 V.

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2—600 GPM, 2310′ head, 8-stage, Gould centrifugal pumps on basis with 450HP, 3550 RPM, 2300/4160V, 60 cycle, 3 phase Allis Chalmers dripproof motors—Each $6600.00

1—4210 GPM, 275′ head Ingersol-Rand centrifugal pump—No motor—No base. Motor requirement 400 HP, 1750 RPM—$750.00

1—400 GPM, 700′ head Worthington centrifugal pump with base and 100 HP, 3550 RPM, 440/60/3 General Electric dripproof motor—$2100.00

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MOTOR GENERATOR SETS

2—300 KW GE Syn. 275 V. 1200 RPM
1—300 KW GE Syn. 275 V. 900 RPM
1—300 KW GE Syn. 275 V. 25 Cy.
2—150 KW GE Syn. 275 V. 1200 RPM
2—100 KW GE Syn. 275 V. 1200 RPM

ROTARY CONVERTERS

2—500 KW GE Syn. 275 V. 1200 RPM
1—500 KW West. Syn. 275 V. 1200 RPM
2—300 KW Al.-Ch. Syn. 275 V. 1200 RPM
1—300 KW West. Syn. 275 V. 1200 RPM
1—200 KW GE Syn. 275 V. 1200 RPM
1—150 KW GE Syn. 275 V. 1200 RPM
1— 75 KW GE Syn. 275 V. 1800 RPM

MINE LOCOMOTIVES

2—20T WEST. 250 V. 56½″ Ga.
2—13T WEST. 50 V. 42-36″ Ga.
4— 8T GOOD. 250 V. 36″ Ga.
1— 8T WEST. 250 V. 28-24″ Ga.
4— 6T WEST. 250 V. 30-24″ Ga.
2— 4T WEST. 250 V. 18″ Ga.

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HOISTS—SINGLE DRUM ELECTRIC

1—11 HP Vulcan #0
1—15 HP H & B
1—20 HP H & B
1—20 HP McFarlane
1—25 HP Vulcan #1½
1—30 HP Vulcan #22C
1—37 HP Single Drum
1—40 HP Vulcan #22C
2—50 HP H & B
1—50 HP Fairbanks-Morse
1—50 HP Vulcan
1—50 HP Box
1—75 HP Vulcan
2—100 HP Box
1—112 HP Vulcan
2—125 HP Ottumwa
2—150 HP Vulcan
2—200 HP Ottumwa
1—250 HP Ottumwa

HOISTS—DOUBLE DRUM ELECTRIC

1—75 HP with Post Brakes
1—75 HP Vulcan #80D. Post Brakes. 75 HP Motor & 50' steel head frame
1—82 HP Vulcan #5½
1—100 HP Webster, Clamp & Lane
1—150-200 HP Ottumwa
1—150 HP Jackson

AIR TUGGER HOISTS

1—Ingersoll-Rand Model DU
2—Ingersoll-Rand Model D6U
4—Ingersoll-Rand Model IH
1—Sullivan Model E-111
9—Ingersoll-Rand Model EUA
1—Ingersoll-Rand Model 10-H
8—Gardner-Denver Model HK
2—Joy "Turnbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
3—Ingersoll-Rand Model H4

ELECTRIC TUGGERS AND SLUSHERS

4—5 HP Sullivan, 2 drum slushers
1—5 HP Sullivan tugger
2—7½ HP Sullivan tuggers
1—10 HP Sullivan 3 drum slusher
2—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
2—20 HP Ingersoll-Rand size 20NM2C, 2 drum slushers
1—50 HP Sullivan Model CF-211 double drum slusher
1—10 HP Ingersoll-Rand 3 drum, model 10MNM-2G

AIR SLUSHERS

4—Ingersoll-Rand Model A5NNOH
4—Joy Model FF211
1—Ingersol-Rand Model HNN-1J

LOADERS

17—Eimco 12B, 18" ga.
8—Eimco 21, 18" & 24" ga.
3—Gardner-Denver Model 9, 18" ga.
1—Joy HL3, 18" ga.
1—Joy HL20, 24" ga.

APRON FEEDERS

1—24" x 20' Link-Belt
1—42" x 18' Stephens-Adamson

DRILLING EQUIPMENT

14—Ingersoll-Rand Model R48 Stopers
20—Ingersoll-Rand Model JR38A Jack Drills
7—Gardner-Denver Model FL48-4 Air Leg Drills
3—Thor Model 390 Air Leg Drills
6—Atlas Copco Model BBL22 Jack Drills
6—Ingersoll-Rand Model DA35 Drifters

GYRATORY CRUSHERS

1—2' Symons Cone
1—12" Traylor Type T
1—2' 4" Traylor Type TY
1—3' Traylor Type TY

PUMPS—SAND

3—1" Denver
1—1½" Kimball-Krogh
1—1½" Vacseal
1—2" Denver
2—2" A.S.H. Hydroseal
1—2" Vacseal
4—2" Wilfley
1—3" A.S.H. Hydroseal
2—3" Wilfley
2—4" A.S.H. Hydroseal
1—4" Wilfley
1—6" Amsco

SCREENS

1—3' x 6' Symons Single Deck
1—3' x 6' Robins Gyrex
1—4' x 10' Allis-Chalmers Double Deck

TANKS

4—8' x 11'6" Acid Storage Tanks
1—25,000-gal. Steel Tank

BALL AND ROD MILLS

1—4' x 4' Marcy Ball Mill
1—6' x 4' Hardinge Conical Ball Mill
1—6' x 6' Allis-Chalmers Ball Mill
1—7' x 5' Allis-Chalmers Ball Mill
1—8' x 22" Hardinge Conical Ball Mill
1—3' x 8' Morse New Rod Mill
1—4' x 10' Hardinge Rod Mill
2—5' x 10' Traylor Rod Mills

JAW CRUSHERS

6—2¼" x 3½" New Morse Lab Crushers
6—4" x 6" New Morse Lab Crushers
1—6½" x 7" Hendy Jaw Crusher
1—8" x 15" Wheeling Jaw Crusher
1—9" x 16" Day Jaw Crusher
1—9" x 16" Universal Jaw Crusher
1—10" x 16" Universal Jaw Crusher
1—12" x 24" Universal Jaw Crusher
1—9" x 36" Cedar Rapids Jaw Crusher
1—42" x 48" Traylor Jaw Crusher

CONCENTRATING TABLES

10—Deister Diagonal Deck Right Hand
10—Deister Diagonal Deck Left Hand
5—Deister Overstrom Diagonal Deck Left Hand

LOCOMOTIVES

6—1½ Ton Mancha "Trammers"
1—1½ Ton General Electric Battery Locomotive
3—3½-4 Ton Mancha "Titan A" Battery Locomotives
1—4 Ton Westinghouse Battery Locomotive
1—4 Ton General Electric Trolley Locomotive
1—6 Ton Goodman Trolley Locomotive
1—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
2—7 Ton General Electric Battery Locomotives
1—7 Ton Jeffrey Trolley Locomotive
1—7 Ton Atlas Battery Locomotive
2—8 Ton Goodman Battery Locomotives
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
1—13 Ton Jeffrey Trolley Locomotive
1—13 Ton Goodman Trolley Locomotive
1—15 Ton Jeffrey Trolley Locomotive

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Denver 2, Colorado

FOR SALE

Tamaya Model #17 Precise Transit 20 second verniers; extension tripod $395.00 F.O.B. Tri-Spective Engineering, 307 Rose Avenue, Venice, California.

1½ Ton Diesel Locomotive—New—Full Diesel engine—550-600 lbs. draw bar pull. Exhaust gas water scrubber. In stock and ready for immediate shipment. $3500.00 F.O.B. Denver, Colorado.

HACK ENGINEERING COMPANY
124 WAZEE MARKET DENVER 4, COLORADO
TAbor 5-5248

Flotation: 8 Fag 44x44 cells v-belt-dr.
Rod Mill: 4x8 DECo. peripheral discharge
Crushing Plant: 20x36 r.b. crusher; 2-deck screen, 24" belt conveyor. Portable
Battery Locos: 2 Mancha Little Trammers.
Compressor: 600 cfm Joy WN-102, motr 100 hp

Paul F. Smith
39 W. Adams St. —— Phoenix, Arizona

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PENNSYLVANIA—Model 5060 Hammermill, 400 HP.
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ALLIS CHALMERS—7' x 24' Compeb Mill.
ROTARY KILNS: 8' x 125', 9' x 201', 11' x 201'.
ROTARY DRYERS: 4'6" x 40', 6' x 50', 8 x 60.
K-V-S Gyratory Crusher, size 49.

PERRY EQUIPMENT CORP.
1429 N. 6th St. Phila. 22, Pa.
POplar 3-3505

Index of Advertisers In Mining World

** Asterisk indicates firms whose products are catalogued in* MINING WORLD'S *1958 Catalog, Survey & Directory Number.*

*Allis-Chalmers International ..... WM 14
(World Mining Only)
Allison Steel Mfg. Co. 87
*Alloy Steel & Metals Co. .. 82
*American Cyanamid Co. 25
*American Manganese Steel Div. 30, 72
*American Smelting & Refining Co. 70
*American Zinc Sales Co. 78
*Anaconda Co. 52
Arizona Testing Laboratories 86
*Atlas Car & Mfg. Co. 80
*Atlas Copco ..... WM 1
(World Mining Only)

Bailey & Van Horn 86
Bennetts Chemical Laboratory, Inc. 86
Black & Deason 86
*Boyles Bros. Drilling Co. 73
*Boyles Bros. Drilling Co., Ltd. 13
*British Ropeway Eng. Co., Ltd. ..... WM 20
(World Mining Only)
*Brunner & Lay, Inc. 76
*Bucyrus-Erie Co. 12
*Bunker Hill Co. 78
Business Men's Clearing House 88

Cannon Associates, Harry B. 82
*Card Iron Works, C. S. 63
Caterpillar Tractor Co. ... 2, 11
Chapman, Wood & Griswold 86
*Chiksan Co. 81
*Christensen Diamond Products Co. 69
*Clark Equipment Intl., C. A. ..... WM 27
(World Mining Only)
*Coast Mfg. & Supply Co. .. 64
Colorado Assaying Co. 86
*Colorado Fuel & Iron Corp. 16
*Colorado Iron Works, sub. of Mine & Smelter Supply Co. 28
Cooke, Everett & Associates 82
Cowin & Co., Inc. 86

Dale, Wade M. 86
Deggendorfer, T. G. 86
*Deister Concentrator Co., Inc. 85
Denver Equipment Co. Inside Back Cover
Diamond Drill Contracting Co. 86
Dickinson Laboratories, Inc. 86
*Door-Oliver, Inc. 22
*Dow Chemical Intl. Ltd. WM 50
(World Mining Only)
Eakland & Osterstock 82

Eimco Corp. ..... WM 16
Outside Front Cover
(World Mining Only)
Ellicott Machine Corp. 84
Elliott, D. H. 86
*Euclid Div., General Motors Corp. 24
*Euclid Div., General Motors Overseas Operations WM 49
(World Mining Only)
Fairchild Aerial Surveys, Inc. 57
Federal Pipe & Tank Co. ... 89
Frederick, Francis H. 86

*Gardner-Denver Co. 17
Geological & Engineering Associates 86
*General Motors Corp., Euclid Div. 24
*General Motors Overseas Operations ..... WM 6
(World Mining Only)
*General Motors Overseas Operations, Euclid Div. ..... WM 49
(World Mining Only)
*Getman Brothers 66
*Godoy & Co., Inc., E. A. ... 85
Goodall Brothers 86
Goodyear Intl. Corp. ..... WM 11
(World Mining Only)
Gripholst, Inc. 64

Hack Eng. Co. 89
*Hardinge Co., Inc. 77
*Harnischfeger Corp. 14-15
*Harnischfeger Intl. Corp. ..... WM 12-13
(World Mining Only)
*Hawthorne, Inc., Herb J. WM 24
(World Mining Only)
Hughes Tool Co. ..... WM 19
(World Mining Only)

*Ingersoll-Rand Co. 23
*International Harvester Co. 20-21
*International Harvester Export Co. ..... WM 2
(World Mining Only)
*International Smelting & Refining Co. 78
*Isbell Construction Co. 73

*Johnson-March Corp. 62
*Joy Mfg. Co. 74

Kane, William G. 86
Kellogg Exploration Co. 86
Kennedy, Thomas W. 87
Kirk Co., Wallace E. 88

*Lectromelt Furnace Co. 56
*LeTourneau-Westinghouse Co. 27, 29
Lima Armature Works, Inc. 88
*Longyear Co., E. J. 82
Loofbourow, R. L. 82

Machinery Center, Inc. 88
*Magma Copper Co. 78
*Marion Power Shovel Co. ... 31
McClintock Co., R. S. 86
McMillan, W. D. 86
*Merrick Scale Mfg. Co. 85
*Mine & Smelter Supply Co. 10, 28
*Mirrlees Bickerton & Day, Ltd. ..... WM 52
(World Mining Only)
Morse Bros. Machinery Co. 89
*Motor Rail, Ltd. ..... WM 54
(World Mining Only)

*National Malleable & Steel Castings Co. 6

O'Donnell & Schmidt 82
O'Keefe, John J. 86

*Pacific Foundry Co., Ltd. 64
Pena & Associates 82
Perry Equipment Corp. 89

Reed Engineering 82

Sanford Day Iron Works 18-19
Schaefer & Associates, F. C. 82
Scheidenhelm, F. W. 86
Shamrock Drilling Enterprises, Inc. 82
*Simplex Wire & Cable Co. .. 1
Smith, Paul F. 89
Southern Spectographic Laboratories 86
Stanhope, R. C. 90
Still & Still 86
*Stoody Co. 54
*Sturtevant Mill Co. ..... WM 3
(World Mining Only)
*Syntron Co. 79

Thomas, Conrad W. 86
*Timken Roller Bearing Co. ... 8
*Traylor Eng. & Mfg. Co. 26
Tri-Spective Engineering 89
Turner & Associates 86
*Tyler Co., W. S. 80

*U. S. Steel Corp. 60
*U. S. Steel Export Co. ..... WM 47
(World Mining Only)

Wade, W. R. 87
*Western Machinery Co. Inside Front Cover
*Western Rock Bit Mfg. Co. 68
Westfall Equipment Co. 50
*Westinghouse Electric Intl. Co. ..... WM 8
(World Mining Only)
Westvaco Chlor Alkali Div. 4
*Wilfley & Sons Inc., A. R. Outside Back Cover
Willys Overland Export Corp. ..... WM 17
(World Mining Only)
Wilson Exploration Co. 86
Wilson, Glenn B. 89
*Windeler Co., Ltd., George 74
*Winter Weiss Co. 83
Wisser & Cox 86
Wood Assaying Co., Henry E. 86

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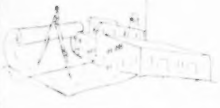

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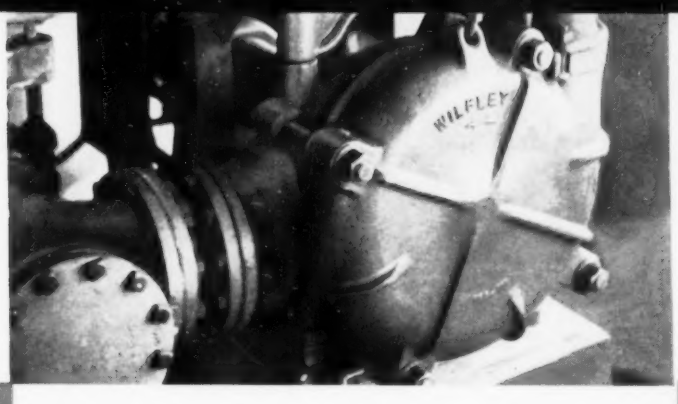

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